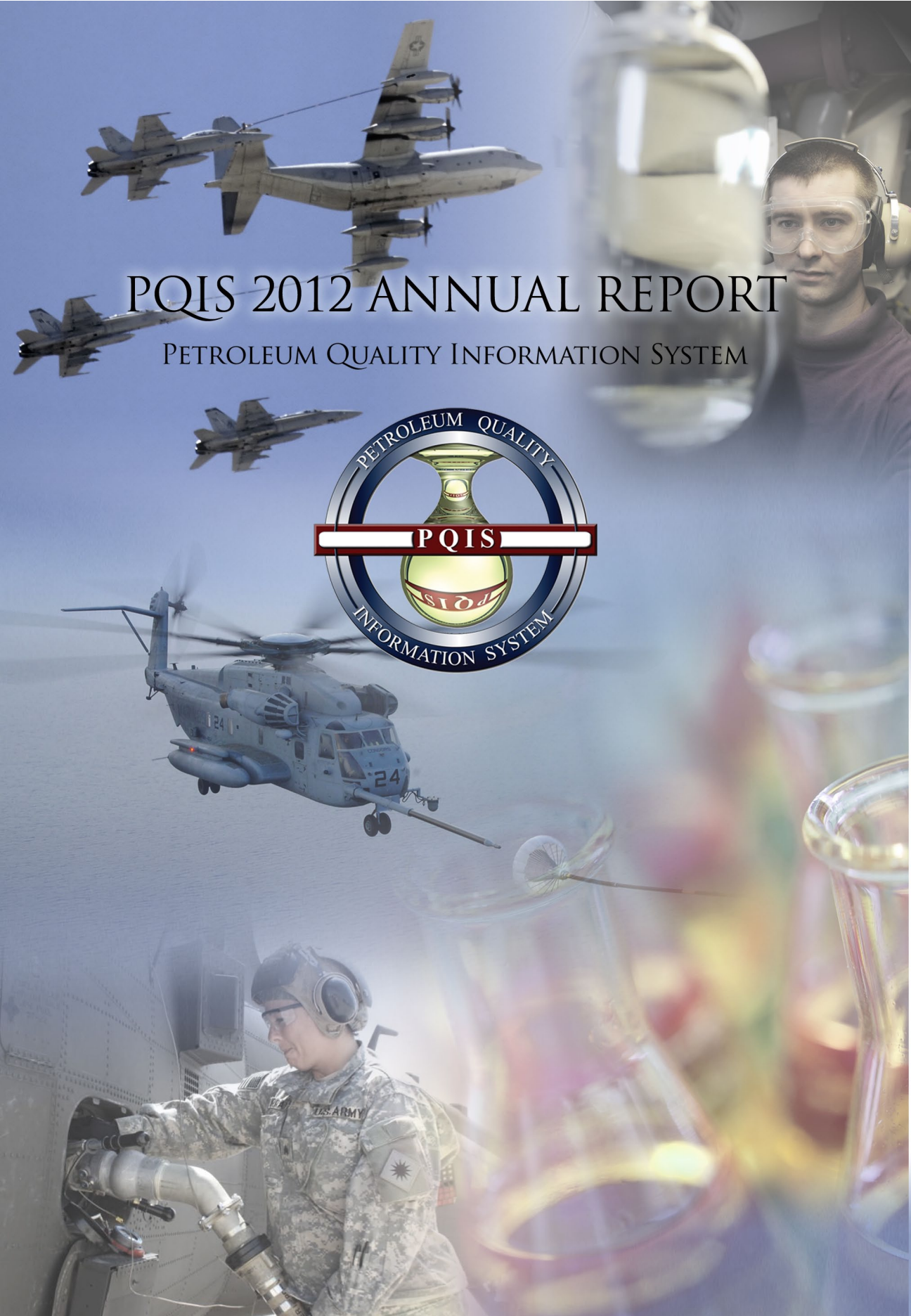

PQIS 2012 ANNUAL REPORT

Petroleum Quality Information System

Report Documentation Page

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A CD-ROM is included with the 2012 Petroleum Quality Information System (PQIS) Annual Report (see inside back cover). The CD-ROM contains the following features:

- The 2012 PQIS Annual Report
- All historical PQIS Annual Reports
- Abridged copies of PQIS databases (stripped of sensitive material)
- Detail Specification sheets for various products
- The DLA Energy Mission video and a Sandy Relief Effort video
- Web-links to the Defense Logistics Agency website and the Defense Logistics Agency Energy *Energy Source* magazine
- A Feedback/Comments screen

DEFENSE LOGISTICS AGENCY
ENERGY
8725 JOHN J. KINGMAN ROAD
FORT BELVOIR, VIRGINIA 22060-6222

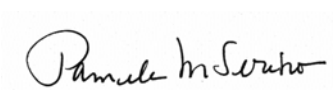
PETROLEUM QUALITY INFORMATION SYSTEM 2012 ANNUAL REPORT

DLA Energy is pleased to provide you with the 2012 edition of the "Petroleum Quality Information System (PQIS)." PQIS is an annual publication which is managed by the Quality / Technical Support office of DLA Energy. DLA Energy, in conjunction with the services, is pleased to continue providing fuel quality data for procured alternative fuels utilizing multiple processing techniques. This analysis, an early look at the quality of advanced alternative fuel processing techniques, represents the fuel used by the services to certify and approve their use in Military equipment. We are pleased to announce continued growth in the variety of products which are featured in this publication. This year, analysis is provided for one additional alternative fuel, ATJ8, as well as additional reporting for HRD76 and HRJ5. Analysis of the following products is continued from previous years:

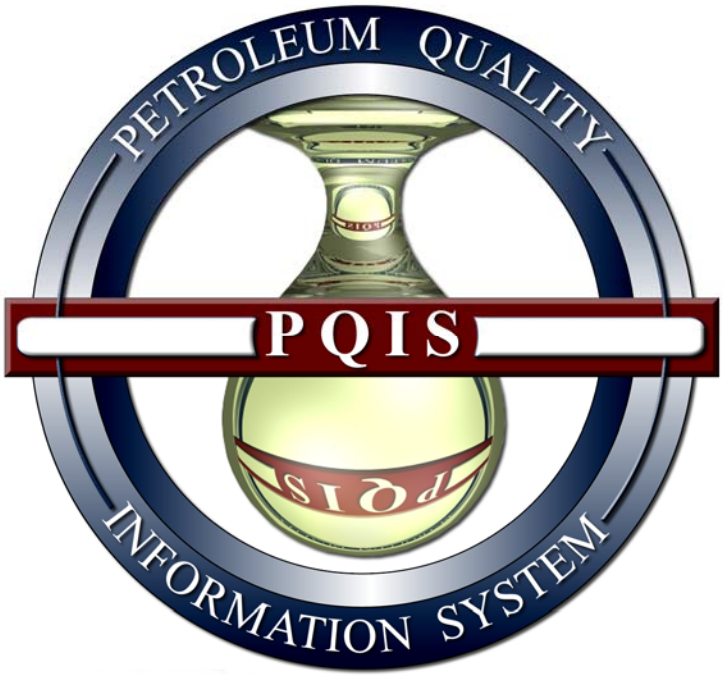
- Aviation Fuels: JAA, JA1, JP4, JP5, JP8, JPTS and TS1
- Marine Fuels: Fuel Naval Distillate (F76), Marine Gas Oil (MGO), Intermediate Fuel Oil (RME180)
- Propellants: High Density Synthetic Hydrocarbon (JP10), and Rocket Grade Kerosene (RP1 and RP2).
- Lubricants: LTL, LO6, and LA6
- Alternative Fuels: Hydrotreated Renewable Jet (HRJ5, HRJ8 and HRD76)
- Additive: Fuel System Icing Inhibitor

We would like to thank the Quality Assurance Representatives (QARs) of DLA Energy and the representatives from the suppliers under our DLA Energy Contracts who have worked with the PQIS Team to ensure complete representation of purchased product. The result is the only worldwide comprehensive data repository of test results for refined fuel, lubricant, and fuel additive properties.

In our continued effort to provide you with reliable, accurate information, we would appreciate any feedback noting updates or suggestions on improving this book. Please contact Mr. Douglas Martin at Commercial (703) 767-8382, e-mail douglas.martin@dla.mil, with any questions or to obtain additional copies of this report or the CD-ROM.



PAMELA SERINO
Director, Quality Technical Support Office
Defense Logistics Agency Energy


PETROLEUM QUALITY
PQIS
INFORMATION SYSTEM

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1. Executive Summary

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Quality/Technical Support Directorate (DLA Energy–Q)

DLA Energy–Q (comprising QT, QA, and QR) provides quality and technical support in certification, quality assurance, and emerging research for supplying DLA Energy customers with fuel and energy-related products.

Product Technology and Standardization Division (DLA Energy–QT)

DLA Energy–QT acts as the principal technical adviser to the Director of DLA Energy for technical matters on petroleum, missile fuels, coal, and related products and services. It maintains specification and measurement contract clauses and represents DLA Energy at industry standardization groups to ensure that product specification changes do not adversely impact end-user applications. The division reviews and approves all cataloging changes for both petroleum and aerospace energy products and serves as the lead standardization activity for petroleum products in the Department of Defense (DoD). QT provides technical support for the introduction of new supply lines such as alternative fuels and for resolving problems in storage tanks, transportation, and handling systems caused by fuel chemistry. In addition, QT maintains the PQIS database.

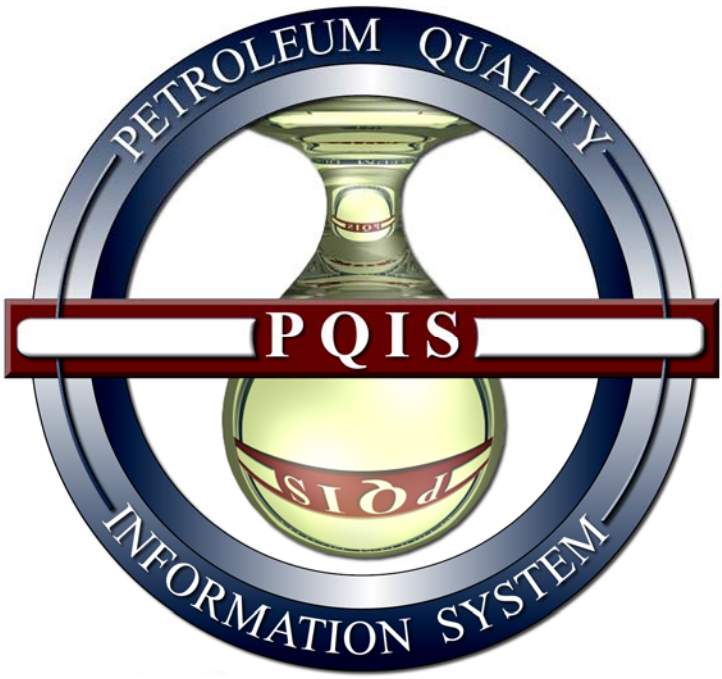
Quality Operations Division (DLA Energy–QA)

DLA Energy–QA acts as the principal adviser and assistant to the Director for developing, monitoring, coordinating, publishing, and implementing quality policies and programs for DLA Energy–supplied commodities. It provides quality assurance (QA) and quality surveillance (QS) support to DoD and civilian agencies as defined in interservice support agreements and directives.

Quality Research Division (DLA Energy–QR)

DLA Energy–QR is the research and development (R&D) arm of DLA Energy–Q, which seeks out R&D solutions for renewable energy initiatives as well as alternative and synthetic fuels to meet military service needs while reducing DoD's carbon footprint. These solutions help secure installation energy, reduce petroleum need and consumption, and deliver fuel more efficiently and economically.

1. Executive Summary



2. Introduction

2012 PQIS Report Information

Terminology

Spectender. A complete specification analysis report of a product being offered for acceptance by the U.S. Government. It is the written report of results for full specification testing of a designated batch of product offered for acceptance.

Batch Analysis. Reflects one spectender series of test results (batch), regardless of how many shipments are made from the source tank or whether more than one tank is involved in a total loading or product movement.

Volume. For the purposes of this report, volume is expressed in millions of U.S. gallons, unless otherwise indicated.

Region. A grouping of states or countries into defined geographical areas, affording a more specific or focused data analysis for a particular area of interest. It is based on the U.S. Department of Energy–designated Petroleum Administration for Defense Districts (PADDs), cited here to provide a standard industry reference for comparative study. These do not correlate with the Defense Fuel Regions or Offices. Because shipments can originate and terminate in different regions, the determination of the region is based on the refinery location, rather than on the receipt location.

Mean. The test result of each batch analysis added and divided by the number of batches. This average is based on occurrences of test values.

Example: Batch A, representing 1,000,000 U.S. gallons with a flash point of 46.0 °C, and Batch B, representing 500,000 U.S. gallons with a flash point of 43.5 °C.

Calculation: (46.0 + 43.5)/2 = mean or average flash point of 44.75 °C.

Weighted Mean. The volumetrically weighted average, based on volumes of product represented by test values.

Example: Batch A, representing 1,000,000 U.S. gallons with a flash point of 46.0 °C, and Batch B, representing 500,000 U.S. gallons with a flash point of 43.5 °C.

Calculation: [(46.0 × 1,000,000) + (43.5 × 500,000)]/1,500,000 = (67,750,000/1,500,000) = weighted mean flash point of 45.17 °C.

Note: Here, the two averaging methods differ by 0.42 °C. Each uses a different basis to calculate the average. Means are provided for each property characteristic for total product

procurements in this report. Weighted means are provided as well and are used for histograms and trends.

NR. Not reported or recorded. Used in charts to indicate that no value was used in that instance.

NP. Not procured during the reporting period.

Data Reporting

The data presented in this report have been carefully evaluated for accuracy and completeness. A CD-ROM, which includes abridged copies of PQIS databases stripped of sensitive material, is available to all users. The results of our analyses may have been affected by data in the unabridged version, so your analyses could produce slightly different results.

Although some reporting inconsistencies are inevitable, every effort has been made for complete accountability in collecting, analyzing, and presenting the data in this report. Data shortfalls range from inapplicability because of processing or the test methods employed to exemption in particular contracts or purchase orders. Logistical and data collection challenges also affect the process. The statistics presented are carefully selected and, where possible, weighted against volumetric validations.

Only analysis data from the associated spectender (batch) are used for the completed delivery amounts received during the calendar year. When data fall short or limited procurements reduce the volume of data available, only essential data are charted in summary tables for informational purposes. For instance, see the tables provided in the Product Data section.

In the larger fuel sections included in the report (JP8, JP5, etc.), source inputs tables specify the volume of fuel and the number of reports on which a fuel characteristic was analyzed. Tables show statistical summaries of minimum, maximum, average, and volumetrically weighted means for test results by properties. When applicable, statistical summaries for test properties also are segregated by geographic source of procurement. Histograms chart the distribution of 2012 test results to the volume of fuel, except for TS1, which bases the histograms on the count of batch analyses, as volumes were not recorded for this fuel.

Note: In histograms, the far left bar represents the percent volume of fuel associated with the minimum data value. Any other bar represents the percent volume of fuel greater than the data value of the bar to the immediate left of it and up to and including the value of that bar.

Reporting Overview

Defense Fuel Region and Petroleum Administration for Defense Districts

DoD has 12 regions in the reporting structure. Regions 1 through 5—designated as PADDs—handle CONUS procurements (Figure 2-1). Regions 6 through 12 handle OCONUS procurements. Table 2-1 (page 9) lists all Defense Fuel Regions and their areas of responsibility, and Figure 2-2 (page 9) shows their locations worldwide. These regional designations are used throughout the report to identify the procurement source by geographic area and to outline CONUS and OCONUS bulk procurement acceptance responsibilities and PQIS activity processed by geographic location.

Table 2-2 (page 10) displays an 8-year breakdown by product grade by volume represented in the PQIS database. All bulk products are illustrated for 2012 by percentage of volume by fuel in Figure 2-3 (page 10). Volumes in Table 2-2 and volumes and percentages in Figure 2-3 do not represent what is procured by DLA Energy, but what is processed through the PQIS database through received test reports. Figures 2-4 and 2-5 (page 11) summarize the present and previous reporting year transportation methods used in support of the accepted procurements.

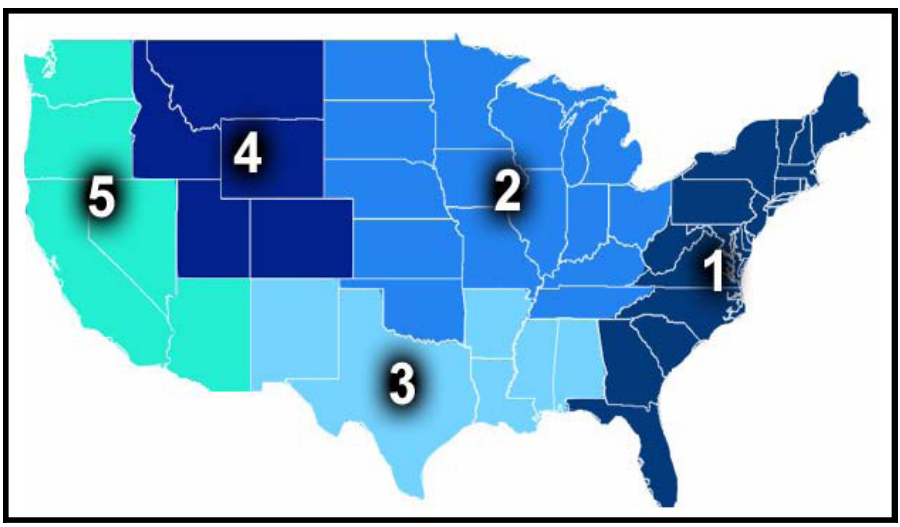


Figure 2-1: Petroleum Administration for Defense Districts

Region	Title	PADDs	State or Countries
1	East Coast	I	ME, VT, NH, MA, RI, CT, NY, PA, NJ, DE, MD, VA, WV, NC, SC, GA, FL
2	East Central	II	ND, SD, MN, IA, NE, WI, MI, OH, KY, TN, IN, IL, MO, KS, OK
3	Gulf Coast	III	AL, MS, AR, LA, TX, NM
4	West Central	IV	MT, ID, WY, UT, CO
5	West Coast	V	WA, OR, CA, NV, AZ
6	Middle East		Kuwait, Bahrain, Pakistan, United Arab Emirates
7	European		Europe, Israel, Turkey
8	Pacific		Korea, Japan, HI, AK, Australia, Russia, Singapore, China
9	Caribbean		Coastal Aruba, Bermuda, Bahamas, Barbados, British Virgin Islands, Cuba, Dominican Republic, Jamaica, Grand Cayman, Martinique, Puerto Rico, Virgin Islands
10	Central & South America		Belize, Columbia, Curacao, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Peru
11	Canada		Canada
12	Africa		Cape Verde, Ghana

Table 2-1: 12 Reporting Defense Regions and Areas of Responsibility

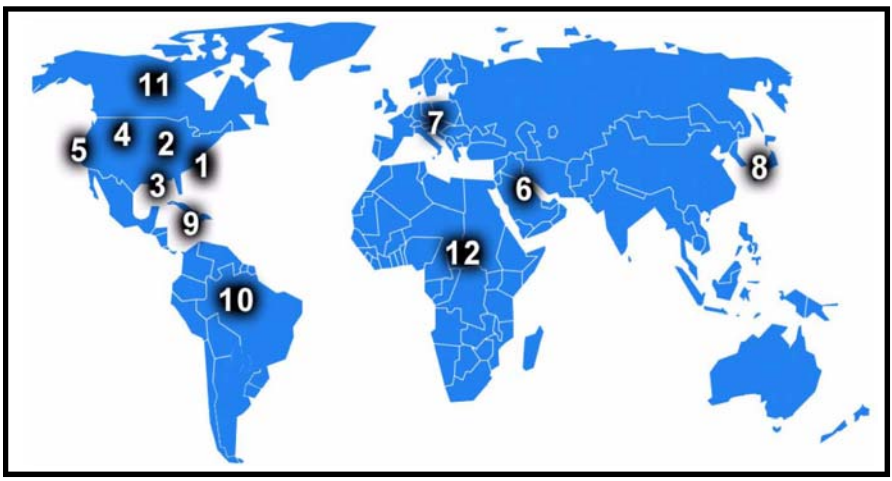


Figure 2-2: Map of the 12 Reporting Defense Regions

8-Year Breakdown by Product Grade by Volume (millions of gallons)								
Product	2005	2006	2007	2008	2009	2010	2011	2012
AN8	3.52	3.60	NR	NR	NR	4.62	NP	NP
JA1	178.63	233.15	326.32	339.20	506.55	302.96	467.90	470.02
JAA	NP	NP	NP	NP	12.01	82.50	55.11	172.90
JP4	0.74	0.69	1.30	0.99	0.83	1.66	0.92	1.33
JP5	588.63	565.17	502.26	481.92	562.86	509.01	532.06	468.27
JP8	2,861.96	2,603.10	2,286.62	2,364.57	1,968.27	1,958.43	1,839.24	1,746.03
JPTS	3.32	1.41	3.89	4.46	3.52	1.92	14.78	3.63
F76	563.38	539.67	565.48	597.01	514.67	507.77	610.24	500.07
RME	11.94	NR	NR	NR	5.12	NR	6.05	NR
MGO	6.51	2.19	5.53	4.45	1.39	4.88	6.71	3.27
Totals	4,218.63	3,948.98	3,691.40	3,792.59	3,575.23	3,373.74	3,533.01	3,365.51

Table 2-2: 8-Year Breakdown by Product Grade by Volume Represented in PQIS (millions of gallons)

Note: Although other products were procured in 2012, such as TS1, RP1, alternative fuels, lubricants, and fuel system icing inhibitor, either volumes were not reported for these fuels or these fuels were procured in limited amounts. In such instances, products were not included in Table 2-2.

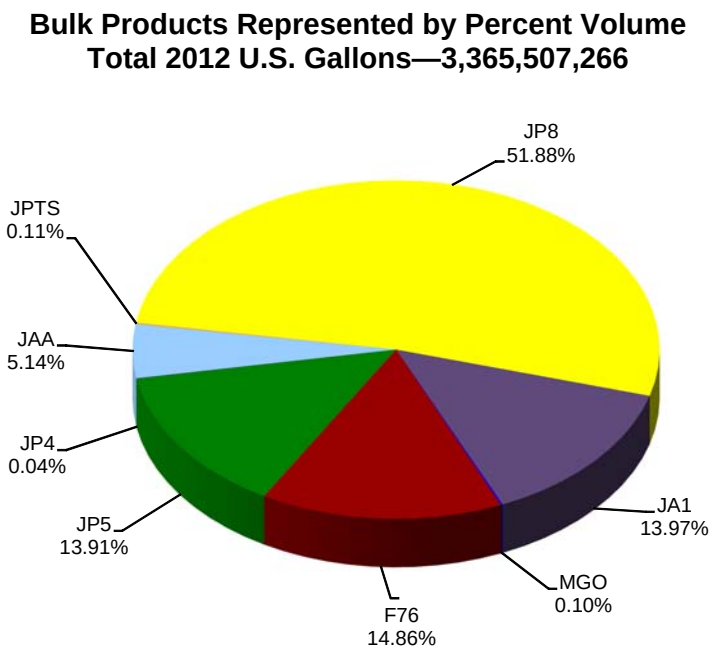


Figure 2-3: 2012 Percentage of Volume by Product Processed in PQIS

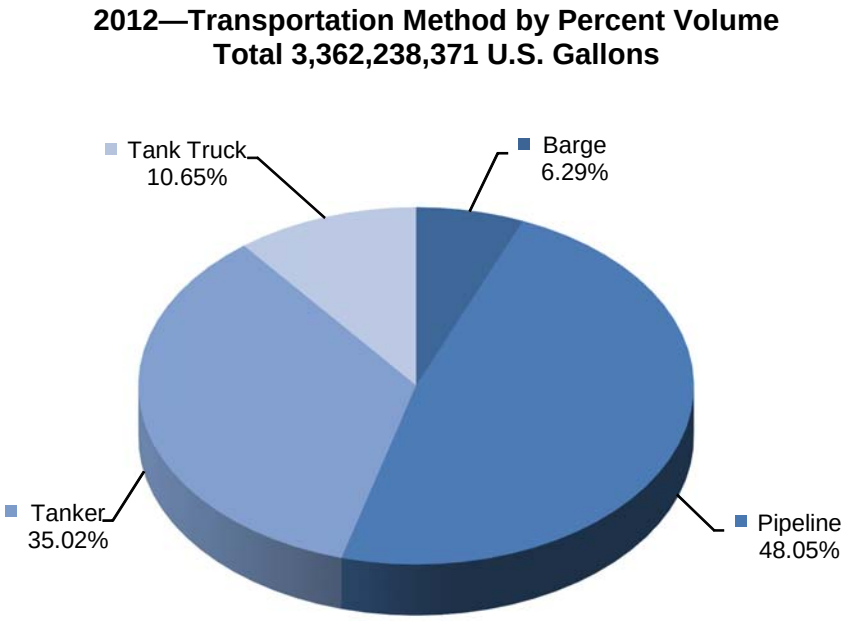


Figure 2-4: 2012 Transportation Mode by Percentage Volume

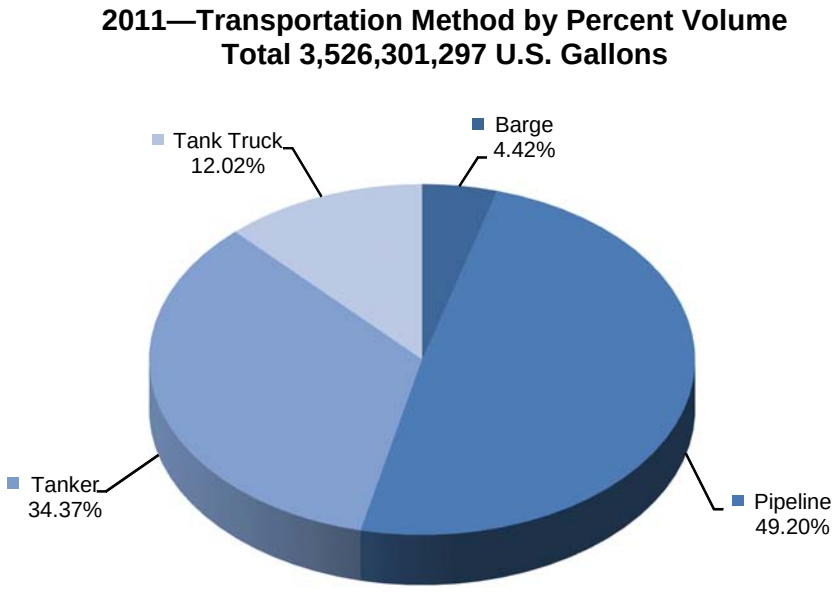


Figure 2-5: 2011 Transportation Mode by Percentage Volume

Note: Transportation modes are not captured for Marine Gas Oil (MGO) in the PQIS database. MGO volume totals are not included in Figures 2-4 and 2-5.

Summary by Region

Table 2-3 breaks down the number of analysis reports processed in the PQIS by product and individual region in 2012. Clause E40.05, Material Inspection and Receiving Report, cited in DLA Energy contracts, requires fuel contractors to submit a copy of the complete laboratory test report from each shipping tank used for shipments to DLA Energy customers. For many fuels in the product sections, source inputs tables detail the volume and number of reports used in calculating product test values. For products with limited batch reports and for region summary tables, only the total test results and volume for the product or region are provided. Analysis and volume totals are not provided for each fuel characteristic in these instances.

PQIS Batch Analysis Reports Processed by Region—2012													
Fuel	1	2	3	4	5	6	7	8	9	10	11	12	Total
AN8	—	—	—	—	—	—	—	—	—	—	—	—	—
JA1	—	—	—	—	—	16	156	5	—	—	—	—	177
JAA	12	28	49	9	85	—	—	—	—	—	—	—	183
JP4	—	—	—	—	—	—	—	137	—	—	—	—	137
JP5	—	—	79	—	61	—	12	21	—	—	—	—	173
JP8	7	316	534	127	149	75	20	145	—	—	—	—	1,373
JPTS	—	—	37	—	—	—	—	7	—	—	—	—	44
JP10	—	—	—	—	—	—	—	—	—	—	—	—	—
F76	—	—	29	—	20	17	10	29	11	—	—	—	118
MGO	29	14	2	—	6	—	—	11	13	36	—	—	111
RDF	—	—	—	—	—	8	—	—	—	—	—	—	8
RP1	—	—	20	—	—	—	—	—	—	—	—	—	20
RP2	—	—	—	—	—	—	—	—	—	—	—	—	—
TS1	—	—	—	—	—	—	—	84	—	—	—	—	84
Totals	48	358	750	136	321	116	198	439	24	36	—	—	2,428

Table 2-3: 2012 Breakdown of Total Number of Analysis Reports Processed in PQIS by Product and Region

12-Year Batch Analysis Reports Processed by Region													
Year	1	2	3	4	5	6	7	8	9	10	11	12	Totals
2001	73	504	1,050	225	439	36	184	362	20	—	—	—	2,893
2002	113	411	1,025	193	464	95	193	290	18	—	—	—	2,802
2003	82	335	866	166	412	174	225	317	24	—	—	—	2,601
2004	6	486	1,121	152	525	195	229	296	14	—	—	—	3,024
2005	131	316	1,200	172	444	195	194	264	53	49	4	2	3,024
2006	18	301	1,111	147	436	261	122	415	43	11	1	—	2,866
2007	118	265	800	131	413	286	138	336	26	26	—	1	2,540
2008	77	315	934	130	426	292	180	327	41	23	2	4	2,751
2009	31	353	922	129	337	121	116	220	7	5	1	—	2,242
2010	52	344	918	134	363	106	117	433	35	50	3	3	2,558
2011	76	379	837	94	416	134	316	382	15	38	1	—	2,689
2012	48	358	750	136	321	116	198	439	24	36	—	—	2,428

Table 2-4: 12-Year Batch Analysis Reports Processed by Region

Note: The region was not recorded for two F76 samples in 2012, but these samples are still included in the 2012 total number of samples in Tables 2-3 and 2-4. One MGO sample with no region assigned is included in the 2011 total.

The values in Table 2-4 represent the PQIS availability of possible spectender analysis reports for individual batches processed by region for calendar years 2001–2012.

Table 2-5 shows a 3-year history of volume by product by region processed in the PQIS.

Although other products were procured in 2012, such as TS1, RP1, alternative fuels, lubricants, and fuel system icing inhibitor, volumes either were not reported for these fuels or these fuels were procured in limited amounts. For these reasons, all products are not included in Table 2-5.

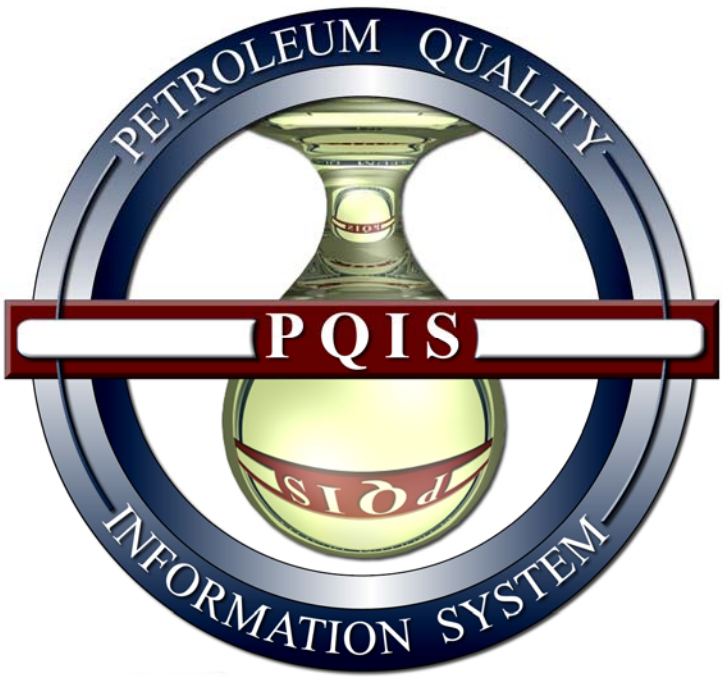
PQIS Annual Volume by Product by Region, 2010–2012 (millions of gallons)

Year	Fuel	1	2	3	4	5	6	7	8	9	10	11	12	Totals
2010	AN8	—	—	—	—	—	—	—	4.62	—	—	—	—	**4.62**
	JA1	—	—	—	—	—	66.59	196.50	51.86	—	—	—	—	**314.95**
	JAA	—	1.55	55.83	—	23.86	—	—	—	—	—	—	—	**81.24**
	JP4	—	—	—	—	—	—	—	1.58	—	—	—	—	**1.58**
	JP5	—	6.96	249.50	—	131.08	9.88	22.80	62.11	—	—	—	—	**482.33**
	JP8	13.72	197.21	739.44	69.04	290.91	185.54	166.43	265.76	—	—	—	—	**1,928.05**
	JPTS	—	—	1.77	—	—	—	—	NR	—	—	—	—	**1.77**
	F76	—	—	123.93	—	54.30	97.97	59.97	163.17	—	—	—	—	**499.34**
	MGO	0.55	0.40	0.02	—	0.39	—	—	1.11	0.50	1.46	0.06	0.08	**4.58**
2011	AN8	—	—	—	—	—	—	—	—	—	—	—	—	**NP**
	JA1	—	—	—	—	—	210.36	257.54	NR	—	—	—	—	**467.90**
	JAA	NR	3.09	18.49	—	33.63	—	—	—	—	—	—	—	**55.20**
	JP4	—	—	—	—	—	—	—	0.93	—	—	—	—	**0.93**
	JP5	—	0.48	235.85	—	99.90	73.87	62.38	56.64	—	—	—	—	**529.12**
	JP8	8.11	228.70	692.81	47.23	312.52	189.09	201.91	145.88	—	—	—	—	**1,826.26**
	JPTS	—	—	4.28	—	—	—	—	NR	—	—	—	—	**4.28**
	F76	—	—	100.16	—	83.86	65.14	111.10	238.20	—	—	—	—	**598.46**
	MGO	0.86	0.62	0.04	—	0.54	—	—	2.76	0.34	1.53	0.02	—	**6.71**
2012	AN8	—	—	—	—	—	—	—	—	—	—	—	—	**NP**
	JA1	—	—	—	—	—	192.55	190.96	63.57	—	—	—	—	**447.07**
	JAA	13.34	24.27	67.92	4.03	44.53	—	—	—	—	—	—	—	**154.09**
	JP4	—	—	—	—	—	—	—	1.83	—	—	—	—	**1.83**
	JP5	—	—	234.76	—	106.52	—	24.07	53.15	—	—	—	—	**418.50**
	JP8	11.59	193.48	675.20	77.55	325.83	152.78	74.04	213.01	—	—	—	—	**1,723.48**
	JPTS	—	—	3.49	—	—	—	—	NR	—	—	—	—	**3.49**
	F76	—	—	129.28	—	50.42	129.73	40.37	157.24	NR	—	—	—	**507.04**
	MGO	0.53	0.28	0.03	—	0.34	—	—	0.69	0.22	1.17	—	—	**3.27**

Table 2-5: Annual Volume of Fuel Processed by Product by Region in PQIS, 2010–2012 (millions of gallons)

Note: The region was not recorded for one MGO sample in 2011, but the volume for this sample is still included in the 2011 total volume for MGO in Table 2-5. The two F76 samples with no region assigned also had no volume entered, so these samples do not impact the total volume for F76 in 2012.

2. Introduction



Product Specifications

The following products are represented in PQIS:

AN8. MIL–DTL–83133 Clause Turbine Fuel, Aviation, AN8

ATJ8. Neat Alcohol-to-Jet Fuel

F76. MIL–DTL–16884 Fuel, Naval Distillate (DFM/NATO Code F-76)

FSII. MIL-DTL-85470, Inhibitor, Icing, Fuel System, High Flash NATO Code Number S-1745

HRD76. Hydrotreated Renewable Marine Diesel

HRJ5. Hydrotreated Renewable JP5

HRJ8. Hydrotreated Renewable JP8

JA1. Turbine Fuel, Aviation, Defence Standard 91–91

JAA. Jet A Turbine Fuel, Aviation, ASTM D 1655 (F-24)

JP4. MIL–DTL–5624 Turbine Fuel, Aviation, Grade JP4, NATO Code F–40

JP5. MIL–DTL–5624 Turbine Fuel, Aviation, Grade JP5, NATO Code F–44

JP8. MIL–DTL–83133 Turbine Fuel, Aviation, JP8, NATO Code F–34

JP10. MIL-DTL-87107 Propellant, High Density Synthetic Hydrocarbon Type, Grade JP–10

JPTS. MIL–DTL–25524 (USAF) Turbine Fuel, Aviation, Thermally Stable

LA6. MIL-PRF-6081, Lubricating Oil, Jet Engine, Grade 1010

LO6. MIL-PRF-009000, Lubricating Oil, Shipboard Internal Combustion Engine, High-Output Diesel

LTL. MIL-PRF-17331, Lubricating Oil, Steam Turbine and Gear, Moderate Service

MGO. ISO-8217, Marine Gas Oil, Grade DMA

MUM. ASTM D4814 Automotive Gasoline, Unleaded, Mid–Grade

PF1. MIL–DTL–87173 (USAF) Propellant, Priming Fluid, ALCM Engine, Grade PF–1

RDF. GOST 305-82, Russian Diesel Fuel

RME180. ISO-8217, Marine Residual Fuel, Grade RME–180

RP1. MIL-DTL-25576 Propellant, Rocket Grade Kerosene, Grade RP-1

RP2. MIL-DTL-25576 Propellant, Rocket Grade Kerosene, Grade RP-2

TS1. GOST 10227-86, Russian Jet Fuel, Grade TC-1, first Category of Quality

The specifications for these products govern the compositions of the fuels procured for DoD. In most tables, this report summarizes only specification properties that have measurable and definitive requirements in the specification. Some exceptions include Cetane index (report) and water content for JP8.

The reporting of select values for properties and characteristics is included where data were recorded in PQIS but not required by specification—for example, various distillation ranges. In most instances, specification properties that involve an assigned rating are not summarized. Data for properties not reported are available on request from DLA Energy–QT.

Various options may apply to product testing, and not all tests are performed on each batch equally for the purpose of data extraction and comparative analysis—for example, the net heat of combustion requirement. Contractors have a choice of test methods or units of measurement for reporting. In the case of performing mercaptan sulfur testing, if the doctor test is negative, a mercaptan test need not be performed. Reporting of mercaptan sulfur results is not consistent with the number of batches. Many providers perform and report both results. In such instances, on the basis of these variables, the number of results selected from the total available analysis by batch may differ for individual test parameters for a given product.

Volume of fuel and the number of analyses used to determine each histogram are included in the source inputs table at the beginning of each product data section. Specification criteria are listed in all test results tables and histograms.

When limited procurements do not support a comprehensive review of a particular fuel, data are presented in a pair of tables, noting the region, volume of fuel, number of batch analyses, minimum value, maximum value, mean, and weighted mean. JAA, JP4, and JPTS are reported for 2012 in this manner. Data for propellants (RP1), alternative fuels (HRJ5, ATJ8, and HRD76), lubricants (LTL, LO6, and LA6), and FSII are summarized in a single table displaying the minimum value, maximum value, and mean for fuel characteristics. Weighted means also are provided for RP1, HRJ5, lubricants, and FSII, as volumes were reported for these products.

JAA—2012 Data Summary

Tables 3-1 and 3-2 display JAA results for the 2012 reporting period, during which Regions 1 through 5 processed JAA procurements. In 2012, 183 analyses were queried from the PQIS, representing 154.09 million U.S. gallons. All batches met specification requirements for all fuel properties measured in 2012.

For JAA, when the smoke point result is below 25 mm, the product is acceptable so long as the naphthalene content is below 3.0 percent and the smoke point is equal to or greater than the

Jet A Turbine Fuel, Aviation, ASTM D 1655 (JAA)			
Property	**2012 Source Inputs**		
	Region	**Volume**	**Analysis**
Total Acid Number: (mg KOH/g)	All	127.80	171
Aromatics: (vol %)	All	131.88	172
Sulfur Mercaptan: (mass %)	All	NR	4
Sulfur, Total: (mass %)	All	132.00	172
Distillation:			
Initial Boiling Point (IBP) (°C)	All	NR	4
10% Recovered, (°C)	All	151.99	182
50% Recovered, (°C)	All	151.99	182
90% Recovered, (°C)	All	151.99	182
Final Boiling Point (FBP), (°C)	All	151.99	182
Residue, (vol %)	All	143.58	179
Loss, (vol %)	All	143.02	178
Flash Point: (°C)	All	151.48	180
Density: (kg/m^3 @ 15 °C)	All	57.59	63
Freezing Point: (°C)	All	150.94	181
Viscosity: (mm^2/s @ –20 °C)	All	130.11	173
Net Heat of Combustion: (MJ/kg)	All	125.70	172
Smoke Point: (mm)	All	134.10	175
Naphthalene: (vol%)	All	124.04	152
Thermal Stability:			
Change in pressure drop, (mm Hg @ 275 °C)	All	38.87	66
Change in pressure drop, (mm Hg @ 260 °C)	All	85.78	107
Existent Gum: (mg/100 mL)	All	126.75	174
Water Separation Characteristics: (rating)	All	138.34	173

Table 3-1: Jet A Turbine Fuel, Aviation, ASTM D 1655 (JAA), 2012 Source Inputs (volume in millions of gallons)

minimum of 18 mm. All 2012 naphthalene values are below 3.0 percent, and all smoke point values are equal to or greater than 18 mm. Therefore, all smoke point values for 2012 are acceptable.

For JAA, the water separation characteristics rating is a minimum of 85 with no electrical conductivity additive and a minimum of 70 with an electrical conductivity additive.

Jet A Turbine Fuel, Aviation, ASTM D 1655 (JAA)						
Property	**Specification Limits**		**2012 Test Results**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Total Acid Number: (mg KOH/g)		**0.10**	0.0000	0.0400	0.0051	0.0069
Aromatics: (vol %)		**25.0**	8.16	21.20	17.47	17.31
Sulfur Mercaptan: (mass %)		**0.003**	0.0008	0.0011	0.0009	NR
Sulfur, Total: (mass %)		**0.30**	0.0010	0.1900	0.0944	0.0869
Distillation:						
Initial Boiling Point (IBP) (°C)	**Report**		141.80	157.80	151.50	NR
10% Recovered,[1] (°C)		**205(185)**	162.50	193.72	172.23	175.33
50% Recovered, (°C)	**Report**		185.00	218.90	200.67	204.16
90% Recovered, (°C)	**Report**		212.30	268.00	243.15	246.42
Final Boiling Point (FBP),[1] (°C)		**300(340)**	226.90	297.00	269.60	270.99
Residue, (vol %)		**1.5**	0.00	1.50	1.08	1.06
Loss, (vol %)		**1.5**	0.00	1.50	0.72	0.81
Flash Point: (°C)	**38**		40.0	110.0	49.23	47.55
Density: (kg/m^3 @ 15 °C)	**0.775**	**0.840**	0.7882	0.8164	0.8077	0.8079
Freezing Point: (°C)		**–40**	–79.0	–41.0	–51.6	–49.8
Viscosity: (mm^2/s @ –20 °C)		**8.0**	3.200	5.920	4.222	4.549
Net Heat of Combustion: (MJ/kg)	**42.8**		43.100	44.000	43.218	43.211
Smoke Point: (mm)	**25.0**		18.0	30.0	22.34	21.71
Naphthalene: (vol%)		**3.0**	0.14	2.60	1.69	1.51
Thermal Stability:						
Change in pressure drop, (mm Hg @ 275 °C)		**25**	0.00	12.70	0.78	0.74
Change in pressure drop, (mm Hg @ 260 °C)			0.00	7.60	0.22	0.11
Existent Gum: (mg/100 mL)		**7.0**	0.00	4.00	1.08	1.13
Water Separation Characteristics: (rating)	**70**		82	100	97.1	97.3

Table 3-2: Jet A Turbine Fuel, Aviation, ASTM D 1655 (JAA), 2012 Test Results

Note 1: Test method D2887 limits in parentheses (°C).

JP4—2012 Data Summary

Tables 3-3 and 3-4 display JP4 results for the 2012 reporting period, during which only Region 8 processed JP4 procurements. One hundred thirty-seven analyses were queried from the PQIS, representing 1.83 million U.S. gallons. Twenty-nine test results were below the minimum specification limit for "Distillation, 50% Recovered." A waiver was granted allowing JP4 to be produced to an older version of the specification, and all values were

MIL-DTL-5624 Turbine Fuel, Aviation, Grade JP4 (NATO F-40)			
Property	**2012 Source Inputs**		
	Region	**Volume**	**Analysis**
Total Acid Number: (mg KOH/g)	8	1.83	137
Aromatics: (vol %)	8	1.83	137
Sulfur, Mercaptan: (mass %)	8	1.83	137
Sulfur, Total: (mass %)	8	1.83	137
Distillation:			
Initial Boiling Point (IBP) (°C)	8	1.83	137
10% Recovered, (°C)	8	1.83	137
20% Recovered, (°C)	8	1.83	137
50% Recovered, (°C)	8	1.83	137
90% Recovered, (°C)	8	1.83	137
End Point, (°C)	8	1.83	137
Residue, (vol %)	8	1.83	137
Loss, (vol %)	8	1.83	137
Density: (API @ 60 °F)	8	1.83	137
Vapor Pressure: (kPa @ 37.8°C)	8	1.83	137
Freezing Point: (°C)	8	1.83	137
Heating Value, Heat of Combustion: (MJ/kg)	8	1.83	137
Hydrogen Content: (mass %)	8	1.83	137
Smoke Point: (mm)	8	NR	NR
Thermal Stability:			
Change in pressure drop, (mm Hg @ 275 °C)	8	1.83	137
Change in pressure drop, (mm Hg @ 260 °C)	8	NR	NR
Existent Gum: (mg/100 mL)	8	1.83	137
Particulate Matter: (mg/L)	8	1.83	137
Filtration Time: (minutes)	8	1.83	137
MSEP: (rating)	8	1.83	137
Fuel System Icing Inhibitor (FSII): (vol %)	8	1.83	137

Table 3-3: MIL-DTL-5624 Turbine Fuel, Aviation, Grade JP4 (NATO F-40), 2012 Source Inputs (volume in millions of gallons)

within the limits allowed by the waiver.

The specification criterion listed for Micro Separometer (MSEP) is presented as the lowest acceptable by specification. The threshold lower limit on MSEP ratings varies from 70 to 90 on the basis of additives and additive combinations.

MIL-DTL-5624 Turbine Fuel, Aviation, Grade JP4 (NATO F-40)						
Property	**Specification Limits**		**2012 Test Results**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Total Acid Number: (mg KOH/g)		**0.015**	0.004	0.011	0.006	0.006
Aromatics: (vol %)		**25.0**	13.1	18.0	15.79	15.85
Sulfur, Mercaptan: (mass %)		**0.002**	0.0003	0.0008	0.0005	0.0005
Sulfur, Total: (mass %)		**0.40**	0.006	0.018	0.012	0.012
Distillation:						
Initial Boiling Point (IBP) (°C)	**Report**		25.8	75.5	51.1	51.0
10% Recovered, (°C)	**Report**		107.7	115.9	113.4	113.5
20% Recovered, (°C)	**100**		114.0	120.8	118.1	118.2
50% Recovered, (°C)	**125**		122.1	129.3	126.1	126.1
90% Recovered, (°C)	**Report**		137.7	144.9	141.4	141.4
End Point, (°C)		**270**	169.7	217.3	184.6	184.0
Residue, (vol %)		**1.5**	0.5	1.5	1.29	1.30
Loss, (vol %)		**1.5**	0.0	1.5	1.13	1.11
Density: (API @ 60 °F)	**45.0**	**57.0**	52.8	54.3	53.21	53.20
Vapor Pressure: (kPa @ 37.8°C)	**14**	**21**	16.17	20.40	17.22	17.24
Freezing Point: (°C)		**–58**	–79.2	–58.0	–65.9	–66.5
Heating Value, Heat of Combustion: (MJ/kg)	**42.8**		43.2	43.3	43.24	43.24
Hydrogen Content: (mass %)	**13.5**		15.40	15.70	15.52	15.52
Smoke Point: (mm)	**20.0**		NR	NR	NR	NR
Thermal Stability:						
Change in pressure drop, (mm Hg @ 275 °C)		**25**	0.00	1.00	0.33	0.32
Change in pressure drop, (mm Hg @ 260 °C)			NR	NR	NR	NR
Existent Gum: (mg/100 mL)		**7.0**	1.00	3.00	1.18	1.18
Particulate Matter: (mg/L)		**1.0**	0.24	0.92	0.44	0.43
Filtration Time: (minutes)		**10**	2	3	2.91	2.89
MSEP: (rating)	**70**		87	100	95.1	95.1
Fuel System Icing Inhibitor (FSII): (vol %)	**0.10**	**0.15**	0.11	0.14	0.132	0.133

Table 3-4: MIL-DTL-5624 Turbine Fuel, Aviation, Grade JP4 (NATO F-40), 2012 Test Results

JPTS—2012 Data Summary

Tables 3-5 and 3-6 display JPTS results for the 2012 reporting period. Forty-four analyses were queried from the PQIS, representing 3.49 million U.S. gallons. Regions 3 and 8 processed JPTS procurements for this reporting period, but volumes were only recorded for Region 3. All batches met specification requirements for all fuel properties measured in 2012.

MIL-DTL-25524 (USAF) Turbine Fuel, Aviation, Thermally Stable			
Property	**2012 Source Inputs**		
	Region	**Volume**	**Analysis**
Total Acid Number: (mg KOH/g)	All	3.49	44
Aromatics: (vol %)	All	3.49	44
Sulfur, Mercaptan: (mass %)	All	NR	NR
Sulfur, Total: (mass %)	All	3.49	44
Distillation:			
Initial Boiling Point (IBP) (°C)	All	3.49	44
10% Recovered, (°C)	All	3.49	44
50% Recovered, (°C)	All	3.49	44
90% Recovered, (°C)	All	3.49	44
End Point, (°C)	All	3.49	44
Residue, (vol %)	All	3.49	44
Loss, (vol %)	All	3.49	44
Flash Point: (°C)	All	3.49	44
Density: (API @ 60 °F)	All	3.39	41
Freezing Point: (°C)	All	3.49	44
Viscosity: (cSt @ –40 °C)	All	3.49	44
Net Heat of Combustion: (BTU/lb)	All	3.39	43
Hydrogen Content: (mass %)	All	3.49	44
Smoke Point: (mm)	All	3.49	44
Thermal Stability:			
Change in pressure drop, (mm Hg @ 335 °C)	All	3.49	44
Existent Gum: (mg/100 mL)	All	3.49	44
Particulate Matter: (mg/L)	All	3.49	44
Water Separation Characteristics: (rating)	All	3.49	44

Table 3-5: MIL-DTL-25524 (USAF) Turbine Fuel, Aviation, JPTS, 2012 Source Inputs (volume in millions of gallons)

For JPTS, a hydrogen content minimum of 14.00 or a smoke point minimum of 25 mm is acceptable. The sulfur, mercaptan limit or a negative doctor test result is acceptable to meet the specification requirement. For distillation values, test method D2887 limits are in parentheses under the specification limits columns in Table 3-6.

MIL-DTL-25524 (USAF) Turbine Fuel, Aviation, Thermally Stable						
Property	**Specification Limits**		**2012 Test Results**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Total Acid Number: (mg KOH/g)		**0.015**	0.0000	0.0080	0.0051	0.0054
Aromatics: (vol %)	**5.0**	**20.0**	8.0	14.9	11.99	12.14
Sulfur, Mercaptan: (mass %)		**0.001**	NR	NR	NR	NR
Sulfur, Total: (mass %)		**0.30**	0.0001	0.0080	0.0030	0.0035
Distillation (D2887 limits in parentheses):						
Initial Boiling Point (IBP),[1] (°C)	**157**(105)		157.5	174.0	163.7	164.6
10% Recovered,[1] (°C)		**193**(174)	164.0	182.0	170.8	172.0
50% Recovered,[1] (°C)		**204**(207)	171.5	192.0	183.7	185.8
90% Recovered,[1] (°C)		**238**(250)	199.0	226.0	216.5	219.2
End Point,[1] (°C)		**260**(288)	218.5	248.0	237.8	241.2
Residue, (vol %)		**1.5**	0.3	1.5	1.07	1.08
Loss, (vol %)		**1.5**	0.0	1.4	0.48	0.46
Flash Point: (°C)	**43**		44.0	61.0	50.86	51.91
Density: (API @ 60 °F)	**46.0**	**53.0**	47.1	51.0	49.7	50.0
Freezing Point: (°C)		**–53**	–73.5	–53.9	–59.9	–57.6
Viscosity: (cSt @ –40 °C)		**12.0**	4.00	7.90	6.11	6.36
Net Heat of Combustion: (BTU/lb)	**18,400**		18,640	18,763	18,711	18,724
Hydrogen Content: (mass %)	**14.00**		14.03	14.50	14.28	14.32
Smoke Point: (mm)	**25.0**		26.0	28.0	26.80	26.96
Thermal Stability: Change in pressure drop, (mm Hg @ 335°C)		**25**	0.00	7.00	1.27	1.46
Existent Gum: (mg/100 mL)		**5.0**	0.20	1.00	0.63	0.55
Particulate Matter: (mg/L)		**0.3**	0.03	0.29	0.16	0.15
Water Separation Characteristics: (rating)	**Report**		67	96	83.3	84.7

Table 3-6: MIL-DTL-25524 (USAF) Turbine Fuel, Aviation, JPTS, 2012 Test Results

Note 1: Test method D2887 limits in parentheses (°C).

RP1—2012 Data Summary

Table 3-7 displays RP1 results for the 2012 reporting period, during which only Region 3 processed RP1 procurements. Twenty analyses were queried from the PQIS, representing 271.16 thousand U.S. gallons. All batches met specification requirements for all fuel properties measured in 2012.

MIL-DTL-25576, Propellant, Rocket Grade Kerosene, Grade RP-1						
Property	**Specification Limits**		**2012 Test Results**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Aromatics: (vol %)		**5.0**	5.0	5.0	5.0	5.0
Mercaptan-sulfur: (mg/kg)		**3**	3.000	3.000	3.000	3.000
Sulfur, Total: (mg/kg)		**30**	0.000	1.200	0.960	0.988
Specific Gravity: (kg/L @ 15 °C)	**0.799**	**0.815**	0.8074	0.8106	0.8093	0.8092
Distillation:						
Initial Boiling Point (IBP) (°F)	**Report**		355.0	366.1	362.3	362.5
Fuel Evaporated, 10%, (°F)	**365**	**410**	381.2	388.2	385.5	385.8
Fuel Evaporated, 50%, (°F)	**Report**		410.9	416.0	414.0	413.9
Fuel Evaporated, 90%, (°F)	**Report**		458.7	466.2	462.8	462.8
End Point, (°F)		**525**	488.2	499.5	495.1	495.3
Residue, (vol %)		**1.5**	1.2	1.4	1.2	1.2
Loss, (vol %)		**1.5**	0.3	1.4	0.7	0.7
Flash Point: (°F)	**140**		144.0	158.0	153.3	152.4
Hydrogen Content: (mass %)	**13.8**		14.29	14.50	14.33	14.34
Freezing Point: (°F)		**–60**	–107.0	–76.0	–83.4	–84.2
Viscosity: (cSt @ –30 °F)		**16.5**	9.229	11.180	9.791	9.660
Thermal Value, Net Heat of Combustion: (BTU/lb)	**18,500**		18,592	19,033	18,699	18,688
Particulate: (mg/L)		**1.0**	0.00	1.00	0.16	0.14
Olefins: (vol %)		**2.0**	0.30	1.10	0.44	0.44
Existent Gum: (mg/100 mL)		**1**	0.00	1.00	0.95	0.96
Copper Strip Corrosion		**1**	1	1	1	1

Table 3-7: MIL-DTL-25576, Propellant, Rocket Grade Kerosene, Grade RP-1, 2012 Test Results

HRJ5—2012 Data Summary

Table 3-8 displays Hydrotreated Renewable JP5 (HRJ5) results for the 2012 reporting period. Seven analyses were queried from the PQIS, representing 31.53 thousand U.S. gallons.

Hydrotreated Renewable Jet (HRJ5) for Navy						
Property	**Specification Limits**		**2012 Test Results**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Total Acid Number: (mg KOH/g)		**0.015**	0.004	0.011	0.0053	0.0044
Sulfur Content: (ppm)		**15**	0.050	1.000	0.190	0.056
Distillation:						
Initial Boiling Point (IBP), (°C)	**Report**		176.5	190.5	179.6	177.7
10% (T10), (°C)		**205**	190.0	202.1	193.4	192.0
50% (T50), (°C)	**Report**		220.0	236.0	232.5	234.3
90% (T90), (°C)	**Report**		247.6	275.0	270.6	274.3
Final Boiling Point (FBP), (°C)		**300**	256.4	282.0	277.6	281.2
Residue, (vol %)		**1.5**	1.1	1.4	1.2	1.1
Loss, (vol %)		**1.5**	0.2	0.9	0.7	0.8
T90-T10, (°C)	**25**		45.5	82.5	77.1	82.3
Flash Point: (°C)	**60**		62.0	72.0	65.0	63.6
Density: (kg/L @ 15 °C)	**0.760**	**0.845**	0.7657	0.7692	0.7676	0.7672
Freezing Point: (°C)		**–46**	–53.0	–48.9	–52.4	–53.0
Kinematic Viscosity: (mm^2/s @ –20 °C)		**8.5**	6.374	8.194	7.720	7.903
Heating Value: (MJ/kg)	**42.6**		43.990	47.068	44.470	44.032
Cetane Number: (calculated)	**40**		56.6	61.4	59.4	59.6
Total Water: (ppm)		**75**	10	44	16.3	12.0
Nitrogen Content: (ppm)		**10**	0.100	0.400	0.143	0.100
Thermal Stability:						
Pressure Difference, mm Hg @ 280 °C		**25**	0.00	0.00	0.00	0.00
Tube Deposit Rating		**3**	1	1	1	1
Metals: (ppm)		**0.5**	0.01	0.10	0.03	0.01
Alkali Metals and Metalloids: (ppm)		**1.0**	0.01	0.11	0.04	0.03
Hydrocarbon Composition:						
Paraffins (normal and iso), (mass %)	**Balance**		90.0	97.0	96.00	97.00
Cyclo Paraffins, (mass %)		**15.0**	3.0	9.0	3.86	3.00
Total Aromatics, (mass %)		**0.5**	0.2	0.3	0.23	0.22
Particulate: (mg/L)		**1.0**	0.00	0.10	0.050	0.052
Filtration Time: (minutes)		**15**	5	15	7.14	5.80
MSEP: (rating)	**85**		83	96	87.9	86.4

Table 3-8: Hydrotreated Renewable JP5, 2012 Test Results

ATJ8—2012 Data Summary

Table 3-9 displays Neat Alcohol-to-Jet (ATJ8) results for the 2012 reporting period. Three analyses were queried from the PQIS, but volumes were not recorded.

Neat Alcohol-to-Jet (ATJ8) Fuel					
Property	**Specification Limits**		**2012 Test Results**		
	Min	**Max**	**Min**	**Max**	**Mean**
Water: (mg/kg)		**75**	5	23	11.3
Total Acid Number: (mg KOH/g)		**0.015**	0.004	0.006	0.0047
Distillation					
Initial Boiling Point, (°C)	**Report**		173.0	173.8	173.4
10% Recovered, (°C)		**205**	174.9	175.4	175.2
50% Recovered, (°C)	**Report**		177.5	177.8	177.6
90% Recovered, (°C)	**Report**		200.7	205.3	202.3
Final Boiling Point, (°C)		**300**	252.1	258.2	254.5
T90-T10, (°C)	**22**		25.3	30.4	27.1
Flash Point: (°C)	**38**		50.0	50.5	50.2
Thermal Stability:					
Change in pressure drop, mm Hg @ 325 °C		**25**	0.00	1.00	0.33
Heater tube deposit, visual rating		**<3**	0	5	2.0

Table 3-9: Neat Alcohol-to-Jet (ATJ8), 2012 Test Results

HRD76—2012 Data Summary

Table 3-10 displays Hydrotreated Renewable Marine Diesel (HRD76) results for the 2012 reporting period. Two analyses were queried from the PQIS, but volumes were not recorded. All batches met specification requirements for all fuel properties measured in 2012.

Hydrotreated Renewable Marine Diesel (HRD76)					
Property	**Specification Limits**		**2012 Test Results**		
	Min	**Max**	**Min**	**Max**	**Mean**
Flash Point: (°C)	**60**		72.0	72.5	72.3
Density: (kg/L @ 15 °C)	**0.774**	**0.876**	0.7850	0.7850	0.7850
Total Water: (ppm)		**200**	44.0	87.0	65.5
Particulate: (mg/L)		**1.0**	0.00	0.10	0.05
Kinematic Viscosity: (mm²/s @ 40 °C)	**1.7**	**4.3**	3.249	3.249	3.249
Cetane Number: (calculated)	**42**	**80**	56.6	71.8	64.2
Distillation					
Initial Boiling Point (IBP), (°C)	**Report**		144.4	190.5	167.5
10% (T10), (°C)	**191**	**290**	202.1	272.6	237.4
50% (T50), (°C)	**Report**		220.0	286.9	253.5
90% (T90), (°C)	**290**	**357**	292.6	292.6	292.6
Final Boiling Point (FBP), (°C)	**300**	**385**	306.0	306.0	306.0
Residue + Loss, (vol %)		**3.0**	1.6	1.6	1.6
T50-T10, (°C)	**Report**		14.3	17.9	16.1
T90-T10, (°C)	**20**		20.0	45.5	32.8
Heating Value: (MJ/kg)	**43.0**		43.748	43.890	43.819
MSEP Diesel Cap:	**85**		96	100	98.0
Acid Number: (mg KOH/g)		**0.08**	0.000	0.011	0.006
Antioxidant: (ppm)	**17.2**	**24.0**	NR	NR	NR
Sulfur Content: (ppm)		**15**	1.000	1.000	1.000
Nitrogen Content: (ppm)		**10**	0.400	0.400	0.400
Metals: (ppm)		**0.5 total**	0.10	0.10	0.10
Alkali Metals and Metalloids: (ppm)		**1 total**	0.10	0.10	0.10

Table 3-10: Hydrotreated Renewable Marine Diesel (HRD76), 2012 Test Results

LTL—2012 Data Summary

Table 3-11 displays LTL results for the 2012 reporting period. One hundred eleven analyses were queried from the PQIS, representing 620.58 thousand U.S. gallons. Aside from 26 water measurements that exceeded the maximum specification limit, all batches met specification requirements for all fuel properties measured in 2012.

For foaming sequences, individual batch results can be viewed in the database on the CD.

MIL-PRF-17331, Lubricating Oil, Steam Turbine and Gear, Moderate Service						
Property	**Specification Limits**		**2012 Test Results**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Sulfur: (%)	**Report**		0.000	0.535	0.176	0.175
Acid Number: (mg KOH/g oil)		**0.3**	0.060	0.300	0.237	0.238
Corrosion (in presence of salt water)	**None**		None	None	None	None
Copper Strip Corrosion Test @ 100 °C: (appearance)		**1**	1	1	1	1
Water: (%)	**None**		0.0000	0.0032	0.0003	0.0004
Gravity: (API)	**Report**		28.60	32.20	31.00	31.00
Flash Point: (°C)	**204**		245.0	276.0	262.0	262.1
Pour Point: (°C)		**–6**	–33.0	–6.0	–19.1	–19.3
Viscosity:						
Centistokes @ 4.4 °C		**870**	744.2	861.7	793.3	793.4
Centistokes @ 40 °C	**74**	**97**	75.05	81.98	78.63	78.61
Centistokes @ 100 °C	**8.0**		9.333	10.290	9.878	9.871
Oxidation by rotating bomb:	**Report**		200.0	712.0	386.2	383.0
Cleanliness: (mg/100 mL)		**4.0**	0.00	1.90	0.43	0.44

Table 3-11: MIL-PRF-17331, Lubricating Oil, Steam Turbine and Gear, Moderate Service (LTL), 2012 Test Results

LO6—2012 Data Summary

Table 3-12 displays LO6 results for the 2012 reporting period. Thirty-three analyses were queried from the PQIS, representing 187.61 thousand U.S. gallons. All batches met specification requirements for all fuel properties measured in 2012.

For foaming sequences, individual batch results can be viewed in the database on the CD.

MIL-PRF-009000, Lubricating Oil, Shipboard Internal Combustion Engine, High-Output Diesel						
Property	**Specification Limits**		**2012 Test Results**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Ash, sulfated: (%)	**Report**		0.000	1.840	1.036	1.071
Copper Strip Corrosion Test @ 100 °C: (appearance)		**1b**	NR	NR	NR	NR
Flash Point: (°C)	**225**		260.0	278.0	268.5	268.5
Gravity: (degree API)	**Report**		25.80	29.50	27.22	27.25
Pour Point: (°C)		**–12**	–39.0	–15.0	–22.7	–22.9
Sulfur:	**Report**		0.317	0.848	0.720	0.714
Total Base Number: (mg KOH/g)	**12**		12.10	14.34	12.86	12.86
Viscosity Index:	**90**		94.0	112.0	102.3	102.4
Viscosity: (cSt @ 100 °C)	**12.5**	**16.3**	12.88	14.15	13.53	13.52

Table 3-12: MIL-PRF-009000, Lubricating Oil, Shipboard Internal Combustion Engine, High-Output Diesel (LO6), 2012 Test Results

LA6—2012 Data Summary

Table 3-13 displays LA6 results for the 2012 reporting period. Twenty-three analyses were queried from the PQIS, representing 83.43 thousand U.S. gallons. All batches met specification requirements for all fuel properties measured in 2012.

MIL-PRF-6081, Lubricating Oil, Jet Engine, Grade 1010						
Property	**Specification Limits**		**2012 Test Results**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Acid Number (T.A.N): (mg KOH/g)		**0.10**	0.000	0.084	0.029	0.027
Viscosity:						
cs @ 37.8 °C	**10.0**		11.030	11.520	11.221	11.246
cs @ –40 °C		**3,000**	1,956.0	2,181.0	2,089.4	2,096.6
Viscosity Stability cs: (% Change @ 3 hours)						
–40 °C		**2**	0.00	0.50	0.23	0.21
Flash Point: (°C)	**132**		134.0	138.0	136.1	136.1
Pour Point: (°C)		**–57**	–69.0	–63.0	–64.9	–64.9
ASTM Color:		**No. 5.5**	1.5	1.5	1.5	1.5
Copper Strip Corrosion: (@ 100 ± °C)		**1**	1	1	1	1
Trace Sediment: (mL/200 mL of oil)		**0.005**	0.001	0.005	0.001	0.001

Table 3-13: MIL-PRF-6081, Lubricating Oil, Jet Engine, Grade 1010 (LA6), 2012 Test Results

FSII—2012 Data Summary

Table 3-14 displays FSII results for the 2012 reporting period. Four hundred one analyses were queried from the PQIS, representing 1.95 million U.S. gallons. All batches met specification requirements for all fuel properties measured in 2012.

MIL-DTL-85470, Inhibitor, Icing, Fuel System, High Flash NATO Code Number S-1745 (FSII)						
Property	**Specification Limits**		**2012 Test Results**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Acid Number: (mg KOH/g)		**0.09**	0.001	0.030	0.012	0.012
Color: (platinum cobalt)		**10**	1.00	7.00	3.76	3.73
Distillation:						
Initial Point (°C)	**191.0**		191.7	193.9	192.9	192.9
Dry Point (°C)		**198.0**	194.6	197.9	196.1	196.1
Ethylene Glycol: (% by weight)		**0.5**	0.000	0.200	0.091	0.089
pH of 25% solution in water: (25+/-2 ° C)	**5.5**	**7.5**	6.20	7.50	7.07	7.06
Relative Density: (20/20 °C)	**1.021**	**1.025**	1.021	1.022	1.021	1.021
Water: (mass %)		**0.1**	0.0040	0.0400	0.0184	0.0182
Flash Point: (°C)	**85**		88.0	109.0	96.0	95.9

Table 3-14: MIL-DTL-85470, Inhibitor, Icing, Fuel System, High Flash NATO Code Number S-1745 (FSII), 2012 Test Results

2012 Product Detailed Assessment Reporting

Product detailed assessments provide minimum, maximum, mean, and volumetrically weighted mean values for each fuel property of the specified grade. These values are presented in table form, providing volumes processed through the PQIS database and regional sources. Also provided are histograms. When significant trending is observed, trend charts based on weighted mean values are presented.

The conformance tables in this report are illustrative in nature and may not represent 100 percent of the particular fuel characteristic, but they delineate sufficient data points to provide an accurate representation. The arithmetic means are based on "occurrence averages"—for example, averaging on submitted data for the characteristic. The tables reflect the number of reports constituting the data set and the corresponding volume in millions of gallons.

Comments noting observed trends are included in the assessment summary for each product where appropriate. These data reflect "Level A procurement quality test data" and do not include values throughout the distribution cycle.

The Level A data reflecting the spectender terminal source or refinery testing set the baseline in fuel quality considerations downstream. Various transport mediums (pipelines, tankers, and tank trucks) and storage conditions can affect product quality.

Batch integrity also may be compromised during the process. DLA Energy–QT can provide transportation data for first-, second-, and third-tier bulk deliveries, but not information on distribution or what constitutes an individual allotment.

Test properties reported in the following sections are specific to JP8, JP5, JA1, F76, MGO, and TS1. Trends noted in these sections are general in nature. Tables showing regional statistics also are provided. Most fuels met all specification requirements. In the few batches where test results were off specification, they were waived, reported incorrectly by the refiner, or transcribed incorrectly into the database.

4. JP8—2012 Data Summary

MIL-DTL-83133 Turbine Fuel, Aviation Kerosene Types, NATO F34 (JP8)			
Property	**2012 Source Inputs**		
	Region	**Volume**	**Analysis**
Total Acid Number: (mg KOH/g)	All	1,677.76	1,265
Aromatics: (vol %)	All	1,669.61	1,264
Sulfur Mercaptan: (mass %)	All	1,453.91	1,160
Sulfur, Total: (mass %)	All	1,669.11	1,263
Distillation:			
Initial Boiling Point (IBP), (°C)	All	1,716.70	1,365
10% Recovered, (°C)	All	1,721.80	1,372
20% Recovered, (°C)	All	1,721.62	1,368
50% Recovered, (°C)	All	1,721.80	1,372
90% Recovered, (°C)	All	1,721.80	1,372
Final Boiling Point (FBP), (°C)	All	1,721.71	1,371
Residue, (vol %)	All	1,355.45	1,129
Loss, (vol %)	All	1,350.33	1,126
Flash Point: (°C)	All	1,721.34	1,370
Density: (kg/L @ 15 °C)	All	1,319.16	969
Freezing Point: (°C)	All	1,716.59	1,371
Viscosity: (mm²/s @ –20 °C)	All	1,673.75	1,264
Net Heat of Combustion: (MJ/kg)	All	1,659.81	1,256
Cetane Index: (calculated)	All	1,660.56	1,349
Hydrogen Content: (mass %)	All	1,667.41	1,258
Smoke Point: (mm)	All	1,673.22	1,266
Naphthalene: (vol %)	All	1,269.04	849
Thermal Stability:			
Change in pressure drop, mm Hg @ 275°C	All	1,618.88	1,232
Change in pressure drop, mm Hg @ 260°C	All	13.91	16
Existent Gum: (mg/100 mL)	All	1,686.58	1,364
Particulate Matter: (mg/L)	All	1,712.68	1,368
Filtration Time: (minutes)	All	1,707.95	1,368
Water Separation Index: (rating)	All	1,677.23	1,259
Fuel System Icing Inhibitor (FSII): (vol %)	All	679.75	617

Table 4-1: Data Summary, MIL-DTL-83133 Turbine Fuel, Aviation, Kerosene Types, NATO F34 (JP8), 2012 Source Inputs

MIL-DTL-83133 Turbine Fuel, Aviation Kerosene Types, NATO F34 (JP8)						
Property	**Specification Limits**		**2012 Test Results**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Total Acid Number: (mg KOH/g)		**0.015**	0.000	0.020	0.006	0.006
Aromatics: (vol %)		**25.0**	9.0	24.9	16.43	17.13
Sulfur Mercaptan:[1] (mass %)		**0.002**	0.0000	0.0020	0.0009	0.0009
Sulfur, Total: (mass %)		**0.30**	0.000	0.290	0.055	0.067
Distillation:						
Initial Boiling Point (IBP), (°C)	**Report**		91.7	193.0	148.7	150.7
10% Recovered, (°C)		**205**	105.0	202.0	172.5	172.4
20% Recovered, (°C)	**Report**		164.3	206.6	180.2	180.2
50% Recovered, (°C)	**Report**		181.0	248.0	200.2	201.2
90% Recovered, (°C)	**Report**		200.0	294.5	239.4	243.4
Final Boiling Point (FBP), (°C)		**300**	215.0	310.0	264.7	268.8
Residue, (vol %)		**1.5**	0.00	1.50	1.05	1.06
Loss, (vol %)		**1.5**	0.00	1.50	0.78	0.80
Flash Point: (°C)	**38**		38.0	69.0	48.9	47.6
Density: (kg/L @ 15 °C)	**0.775**	**0.840**	0.7858	0.8370	0.8034	0.8022
Freezing Point: (°C)		**–47**	–83.0	–47.0	–52.8	–51.3
Viscosity: (mm²/s @ –20 °C)		**8.0**	1.400	7.640	4.325	4.399
Net Heat of Combustion: (MJ/kg)	**42.8**		42.800	43.600	43.240	43.241
Cetane Index: (calculated)	**Report**		30.2	51.4	42.8	43.3
Hydrogen Content: (mass %)	**13.4**		13.40	14.80	13.86	13.85
Smoke Point:[2] (mm)	**25.0**		18.00	30.00	23.58	22.81
Naphthalene: (vol %)		**3.0**	0.00	2.88	1.24	1.24
Thermal Stability:						
Change in pressure drop, mm Hg @ 275°C		**25**	0.00	21.00	0.52	0.52
Change in pressure drop, mm Hg @ 260°C			0.00	3.00	0.56	0.11
Existent Gum: (mg/100 mL)		**7.0**	0.00	7.00	0.99	1.12
Particulate Matter: (mg/L)		**1.0**	0.00	1.00	0.34	0.35
Filtration Time: (minutes)		**15**	1	13	5.88	6.11
Water Separation Index: (rating)	**70**		70	107	93.2	93.5
Fuel System Icing Inhibitor (FSII):[3] (vol %)	**0.10**	**0.15**	0.10	0.15	0.121	0.127

Table 4-2: Data Summary, MIL-DTL-83133 Turbine Fuel, Aviation, Kerosene Types, NATO F34 (JP8), 2012 Test Results

Note 1: Either the sulfur mercaptan limit or a negative doctor test result is acceptable to meet the specification requirement.

Note 2: When the smoke point result is below 25 mm, the product is acceptable so long as the naphthalene content is below 3.0 percent and the smoke point is above the minimum of 19 mm. Waivers were granted for the smoke point values below 19 mm.

Note 3: In September 2012, FSII specification limits changed to 0.07-0.10 vol % because of the publication of MIL-DTL-83133 with amendment 1, but contracts through the end of 2012 all fell under the MIL-DTL-83133H (without amendment 1) revision.

4. JP8—2012 Regional Data Summary

MIL-DTL-83133 Turbine Fuel, Aviation Kerosene Types, NATO F34 (JP8)						
Property	Total Volume		11.59			
	Batch Analysis		7			
	Specification Limits		Region 1			
	Min	Max	Min	Max	Mean	Wt Mean
Total Acid Number: (mg KOH/g)		**0.015**	0.0020	0.0110	0.005	0.005
Aromatics: (vol %)		**25.0**	10.3	18.8	15.7	15.5
Sulfur Mercaptan: (mass %)		**0.002**	0.0010	0.0020	0.0016	0.0016
Sulfur, Total: (mass %)		**0.30**	0.1960	0.2340	0.209	0.209
Distillation:						
Initial Boiling Point (IBP), (°C)	**Report**		151.3	152.6	152.2	152.3
10% Recovered, (°C)		**205**	169.6	172.9	170.7	170.8
20% Recovered, (°C)	**Report**		175.9	178.8	177.0	177.1
50% Recovered, (°C)	**Report**		192.8	196.4	194.5	194.5
90% Recovered, (°C)	**Report**		227.4	235.5	233.4	233.2
Final Boiling Point (FBP), (°C)		**300**	253.3	261.8	258.4	258.2
Residue, (vol %)		**1.5**	0.60	1.20	1.00	1.00
Loss, (vol %)		**1.5**	0.70	1.20	0.93	0.93
Flash Point: (°C)	**38**		42.0	44.0	42.6	42.6
Density: (kg/L @ 15 °C)	**0.775**	**0.840**	0.7910	0.7940	0.7925	0.7924
Freezing Point: (°C)		**–47**	–52.0	–48.0	–49.6	–49.6
Viscosity: (mm²/s @ –20 °C)		**8.0**	3.373	4.012	3.732	3.749
Net Heat of Combustion: (MJ/kg)	**42.8**		43.240	43.385	43.282	43.286
Cetane Index: (calculated)	**Report**		44.2	45.5	44.9	44.9
Hydrogen Content: (mass %)	**13.4**		13.86	14.18	13.95	13.96
Smoke Point: (mm)	**25.0**		22.0	28.0	23.4	23.3
Naphthalene: (vol %)		**3.0**	0.91	2.05	1.42	1.38
Thermal Stability:						
Change in pressure drop, mm Hg @ 275 °C		**25**	0.00	1.00	0.29	0.30
Change in pressure drop, mm Hg @ 260 °C			NR	NR	NR	NR
Existent Gum: (mg/100 mL)		**7.0**	1.00	5.00	2.14	2.12
Particulate Matter: (mg/L)		**1.0**	0.20	0.55	0.30	0.29
Filtration Time: (minutes)		**15**	5	9	7.86	7.92
Water Separation Index: (rating)	**70**		NR	NR	NR	NR
Fuel System Icing Inhibitor (FSII): (vol %)	**0.10**	**0.15**	0.12	0.14	0.133	0.133

Table 4-3: Region 1 Summary

MIL-DTL-83133 Turbine Fuel, Aviation Kerosene Types, NATO F34 (JP8)						
Property	Total Volume		193.48			
	Batch Analysis		316			
	Specification Limits		Region 2			
	Min	Max	Min	Max	Mean	Wt Mean
Total Acid Number: (mg KOH/g)		**0.015**	0.0000	0.0094	0.004	0.004
Aromatics: (vol %)		**25.0**	9.5	22.0	15.6	15.5
Sulfur Mercaptan: (mass %)		**0.002**	0.0000	0.0019	0.0007	0.0008
Sulfur, Total: (mass %)		**0.30**	0.0000	0.1870	0.047	0.052
Distillation:						
Initial Boiling Point (IBP), (°C)	**Report**		91.7	190.5	129.8	136.2
10% Recovered, (°C)		**205**	105.0	200.1	171.4	175.1
20% Recovered, (°C)	**Report**		166.0	206.6	182.8	185.4
50% Recovered, (°C)	**Report**		190.8	248.0	207.0	207.5
90% Recovered, (°C)	**Report**		209.5	294.5	246.4	244.5
Final Boiling Point (FBP), (°C)		**300**	235.5	310.0	276.0	271.6
Residue, (vol %)		**1.5**	0.20	1.50	1.09	1.14
Loss, (vol %)		**1.5**	0.00	1.50	0.63	0.65
Flash Point: (°C)	**38**		41.0	68.0	51.6	51.7
Density: (kg/L @ 15 °C)	**0.775**	**0.840**	0.7879	0.8110	0.8034	0.8032
Freezing Point: (°C)		**–47**	–59.3	–47.2	–52.0	–52.0
Viscosity: (mm²/s @ –20 °C)		**8.0**	1.400	6.780	4.785	4.893
Net Heat of Combustion: (MJ/kg)	**42.8**		42.800	43.600	43.260	43.265
Cetane Index: (calculated)	**Report**		41.2	51.0	44.5	44.5
Hydrogen Content: (mass %)	**13.4**		13.57	14.06	13.83	13.83
Smoke Point: (mm)	**25.0**		20.0	27.0	23.9	23.8
Naphthalene: (vol %)		**3.0**	0.09	2.13	1.27	1.21
Thermal Stability:						
Change in pressure drop, mm Hg @ 275 °C		**25**	0.00	17.90	0.67	0.66
Change in pressure drop, mm Hg @ 260 °C			0.00	0.00	0.00	0.00
Existent Gum: (mg/100 mL)		**7.0**	0.00	4.90	0.82	0.86
Particulate Matter: (mg/L)		**1.0**	0.00	1.00	0.32	0.29
Filtration Time: (minutes)		**15**	1	12	5.12	5.35
Water Separation Index: (rating)	**70**		73	107	93.1	93.2
Fuel System Icing Inhibitor (FSII): (vol %)	**0.10**	**0.15**	0.10	0.15	0.117	0.117

Table 4-4: Region 2 Summary

4. JP8—2012 Regional Data Summary

MIL-DTL-83133 Turbine Fuel, Aviation Kerosene Types, NATO F34 (JP8)						
Property	**Total Volume**		**675.20**			
	Batch Analysis		**534**			
	Specification Limits		**Region 3**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Total Acid Number: (mg KOH/g)		**0.015**	0.0000	0.0150	0.006	0.006
Aromatics: (vol %)		**25.0**	9.0	23.9	15.4	16.8
Sulfur Mercaptan: (mass %)		**0.002**	0.0000	0.0020	0.0011	0.0010
Sulfur, Total: (mass %)		**0.30**	0.0000	0.1818	0.054	0.063
Distillation:						
Initial Boiling Point (IBP), (°C)	**Report**		137.8	187.3	156.4	153.0
10% Recovered, (°C)		**205**	161.0	193.2	175.3	174.2
20% Recovered, (°C)	**Report**		166.0	197.5	181.5	182.0
50% Recovered, (°C)	**Report**		181.0	223.0	197.9	202.4
90% Recovered, (°C)	**Report**		200.0	274.1	231.1	241.6
Final Boiling Point (FBP), (°C)		**300**	215.0	290.7	254.0	265.2
Residue, (vol %)		**1.5**	0.10	1.50	1.02	1.07
Loss, (vol %)		**1.5**	0.00	1.50	0.84	0.87
Flash Point: (°C)	**38**		38.9	66.0	50.5	49.9
Density: (kg/L @ 15 °C)	**0.775**	**0.840**	0.7865	0.8244	0.8020	0.8029
Freezing Point: (°C)		**–47**	–71.0	–47.0	–53.8	–50.7
Viscosity: (mm²/s @ –20 °C)		**8.0**	2.390	7.640	4.257	4.564
Net Heat of Combustion: (MJ/kg)	**42.8**		43.000	43.500	43.284	43.267
Cetane Index: (calculated)	**Report**		34.2	51.4	43.6	44.4
Hydrogen Content: (mass %)	**13.4**		13.40	14.80	13.95	13.94
Smoke Point: (mm)	**25.0**		19.0	30.0	24.4	23.1
Naphthalene: (vol %)		**3.0**	0.00	2.63	1.14	1.32
Thermal Stability:						
Change in pressure drop, mm Hg @ 275 °C		**25**	0.00	14.40	0.40	0.44
Change in pressure drop, mm Hg @ 260 °C			0.00	3.00	1.75	0.69
Existent Gum: (mg/100 mL)		**7.0**	0.00	7.00	0.93	1.22
Particulate Matter: (mg/L)		**1.0**	0.00	0.95	0.32	0.30
Filtration Time: (minutes)		**15**	2	13	5.30	4.98
Water Separation Index: (rating)	**70**		70	100	92.6	94.1
Fuel System Icing Inhibitor (FSII): (vol %)	**0.10**	**0.15**	0.10	0.14	0.118	0.117

Table 4-5: Region 3 Summary

MIL-DTL-83133 Turbine Fuel, Aviation Kerosene Types, NATO F34 (JP8)						
Property	Total Volume		77.55			
	Batch Analysis		127			
	Specification Limits		Region 4			
	Min	Max	Min	Max	Mean	Wt Mean
Total Acid Number: (mg KOH/g)		**0.015**	0.0000	0.0140	0.004	0.004
Aromatics: (vol %)		**25.0**	9.9	24.9	17.1	17.3
Sulfur Mercaptan: (mass %)		**0.002**	0.0000	0.0019	0.0006	0.0006
Sulfur, Total: (mass %)		**0.30**	0.0000	0.10443	0.021	0.022
Distillation:						
Initial Boiling Point (IBP), (°C)	**Report**		110.0	193.0	158.2	154.6
10% Recovered, (°C)		**205**	157.0	202.0	177.9	174.4
20% Recovered, (°C)	**Report**		165.0	206.0	184.6	181.5
50% Recovered, (°C)	**Report**		183.0	219.4	201.8	200.9
90% Recovered, (°C)	**Report**		218.0	253.9	237.1	239.7
Final Boiling Point (FBP), (°C)		**300**	238.0	278.0	261.5	263.3
Residue, (vol %)		**1.5**	0.00	1.50	0.94	0.97
Loss, (vol %)		**1.5**	0.00	1.30	0.52	0.51
Flash Point: (°C)	**38**		38.0	69.0	49.4	47.0
Density: (kg/L @ 15 °C)	**0.775**	**0.840**	0.7945	0.8105	0.8005	0.8007
Freezing Point: (°C)		**–47**	–65.0	–47.3	–52.6	–51.4
Viscosity: (mm²/s @ –20 °C)		**8.0**	2.600	6.499	4.438	4.286
Net Heat of Combustion: (MJ/kg)	**42.8**		43.000	43.500	43.219	43.212
Cetane Index: (calculated)	**Report**		39.3	46.6	42.6	42.6
Hydrogen Content: (mass %)	**13.4**		13.48	14.10	13.78	13.76
Smoke Point: (mm)	**25.0**		20.0	29.0	25.0	23.9
Naphthalene: (vol %)		**3.0**	0.209	1.51	0.93	0.93
Thermal Stability:						
Change in pressure drop, mm Hg @ 275 °C		**25**	0.00	21.00	0.61	0.50
Change in pressure drop, mm Hg @ 260 °C			0.00	1.00	0.25	0.26
Existent Gum: (mg/100 mL)		**7.0**	0.00	6.00	1.26	1.23
Particulate Matter: (mg/L)		**1.0**	0.00	0.98	0.40	0.33
Filtration Time: (minutes)		**15**	4	12	7.17	6.38
Water Separation Index: (rating)	**70**		71	100	94.8	96.5
Fuel System Icing Inhibitor (FSII): (vol %)	**0.10**	**0.15**	0.10	0.15	0.118	0.117

Table 4-6: Region 4 Summary

4. JP8—2012 Regional Data Summary

MIL-DTL-83133 Turbine Fuel, Aviation Kerosene Types, NATO F34 (JP8)						
Property	Total Volume		325.83			
	Batch Analysis		149			
	Specification Limits		Region 5			
	Min	Max	Min	Max	Mean	Wt Mean
Total Acid Number: (mg KOH/g)		**0.015**	0.0010	0.0100	0.004	0.004
Aromatics: (vol %)		**25.0**	10.0	23.2	16.6	17.0
Sulfur Mercaptan: (mass %)		**0.002**	0.0000	0.0020	0.0008	0.0008
Sulfur, Total: (mass %)		**0.30**	0.0000	0.1900	0.053	0.052
Distillation:						
Initial Boiling Point (IBP), (°C)	**Report**		147.0	175.0	155.7	155.3
10% Recovered, (°C)		**205**	159.0	191.0	174.2	176.5
20% Recovered, (°C)	**Report**		167.9	199.0	181.8	185.0
50% Recovered, (°C)	**Report**		186.3	216.2	203.3	207.2
90% Recovered, (°C)	**Report**		224.0	260.1	248.0	249.3
Final Boiling Point (FBP), (°C)		**300**	244.3	291.0	274.5	275.7
Residue, (vol %)		**1.5**	0.10	1.50	1.15	1.08
Loss, (vol %)		**1.5**	0.00	1.50	0.70	0.66
Flash Point: (°C)	**38**		41.0	61.0	48.4	47.9
Density: (kg/L @ 15 °C)	**0.775**	**0.840**	0.8043	0.8370	0.8294	0.8268
Freezing Point: (°C)		**–47**	–83.0	–47.5	–55.0	–52.4
Viscosity: (mm²/s @ –20 °C)		**8.0**	3.300	6.100	4.694	4.862
Net Heat of Combustion: (MJ/kg)	**42.8**		42.900	43.284	43.116	43.146
Cetane Index: (calculated)	**Report**		30.2	45.8	38.6	41.0
Hydrogen Content: (mass %)	**13.4**		13.40	14.50	13.62	13.71
Smoke Point: (mm)	**25.0**		18.0	25.0	20.2	20.1
Naphthalene: (vol %)		**3.0**	0.12	2.24	0.93	1.01
Thermal Stability:						
Change in pressure drop, mm Hg @ 275 °C		**25**	0.00	1.00	0.12	0.01
Change in pressure drop, mm Hg @ 260 °C			NR	NR	NR	NR
Existent Gum: (mg/100 mL)		**7.0**	0.00	3.00	1.06	1.04
Particulate Matter: (mg/L)		**1.0**	0.00	1.00	0.29	0.30
Filtration Time: (minutes)		**15**	3	13	6.39	6.81
Water Separation Index: (rating)	**70**		81	100	92.9	91.2
Fuel System Icing Inhibitor (FSII): (vol %)	**0.10**	**0.15**	0.11	0.15	0.134	0.147

Table 4-7: Region 5 Summary

MIL-DTL-83133 Turbine Fuel, Aviation Kerosene Types, NATO F34 (JP8)						
Property	Total Volume		152.78			
	Batch Analysis		75			
	Specification Limits		Region 6			
	Min	Max	Min	Max	Mean	Wt Mean
Total Acid Number: (mg KOH/g)		**0.015**	0.0100	0.0110	0.010	0.010
Aromatics: (vol %)		**25.0**	17.2	21.1	19.5	19.5
Sulfur Mercaptan: (mass %)		**0.002**	0.0005	0.0011	0.0008	0.0009
Sulfur, Total: (mass %)		**0.30**	0.0150	0.0640	0.031	0.030
Distillation:						
Initial Boiling Point (IBP), (°C)	**Report**		147.0	150.0	148.2	148.0
10% Recovered, (°C)		**205**	160.0	165.0	161.8	161.6
20% Recovered, (°C)	**Report**		165.0	172.0	167.3	167.1
50% Recovered, (°C)	**Report**		182.5	192.0	188.0	187.8
90% Recovered, (°C)	**Report**		236.0	250.0	244.6	245.2
Final Boiling Point (FBP), (°C)		**300**	263.0	288.0	278.3	278.2
Residue, (vol %)		**1.5**	1.10	1.30	1.19	1.19
Loss, (vol %)		**1.5**	1.00	1.00	1.00	1.00
Flash Point: (°C)	**38**		38.0	40.0	39.2	39.3
Density: (kg/L @ 15 °C)	**0.775**	**0.840**	0.7883	0.7910	0.7898	0.7898
Freezing Point: (°C)		**–47**	–51.0	–49.5	–50.5	–50.4
Viscosity: (mm²/s @ –20 °C)		**8.0**	3.110	3.540	3.379	3.372
Net Heat of Combustion: (MJ/kg)	**42.8**		43.284	43.392	43.325	43.325
Cetane Index: (calculated)	**Report**		41.2	44.7	43.2	43.2
Hydrogen Content: (mass %)	**13.4**		13.83	14.01	13.90	13.90
Smoke Point: (mm)	**25.0**		25.0	25.0	25.0	25.0
Naphthalene: (vol %)		**3.0**	NR	NR	NR	NR
Thermal Stability:						
Change in pressure drop, mm Hg @ 275 °C		**25**	2.00	2.00	2.00	2.00
Change in pressure drop, mm Hg @ 260 °C			NR	NR	NR	NR
Existent Gum: (mg/100 mL)		**7.0**	1.00	1.00	1.00	1.00
Particulate Matter: (mg/L)		**1.0**	0.42	0.85	0.63	0.64
Filtration Time: (minutes)		**15**	11	13	11.93	11.98
Water Separation Index: (rating)	**70**		90	97	94.2	94.5
Fuel System Icing Inhibitor (FSII): (vol %)	**0.10**	**0.15**	0.12	0.12	0.120	0.120

Table 4-8: Region 6 Summary

4. JP8—2012 Regional Data Summary

MIL-DTL-83133 Turbine Fuel, Aviation Kerosene Types, NATO F34 (JP8)						
Property	**Total Volume**		**74.04**			
	Batch Analysis		**20**			
	Specification Limits		**Region 7**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Total Acid Number: (mg KOH/g)		**0.015**	0.0000	0.0090	0.006	0.006
Aromatics: (vol %)		**25.0**	14.0	21.1	16.1	15.8
Sulfur Mercaptan: (mass %)		**0.002**	0.0000	0.0019	0.0013	0.0013
Sulfur, Total: (mass %)		**0.30**	0.0000	0.2900	0.171	0.183
Distillation:						
Initial Boiling Point (IBP), (°C)	**Report**		148.0	181.2	153.0	152.3
10% Recovered, (°C)		**205**	163.0	194.2	167.8	167.1
20% Recovered, (°C)	**Report**		170.0	197.1	174.0	173.4
50% Recovered, (°C)	**Report**		184.9	210.1	192.0	191.5
90% Recovered, (°C)	**Report**		223.2	241.0	234.7	234.7
Final Boiling Point (FBP), (°C)		**300**	248.5	264.0	256.6	257.1
Residue, (vol %)		**1.5**	0.80	1.30	1.14	1.14
Loss, (vol %)		**1.5**	0.20	1.30	0.92	0.89
Flash Point: (°C)	**38**		39.0	60.0	45.3	44.9
Density: (kg/L @ 15 °C)	**0.775**	**0.840**	0.7858	0.8209	0.7933	0.7926
Freezing Point: (°C)		**–47**	–80.0	–49.0	–56.6	–55.3
Viscosity: (mm²/s @ –20 °C)		**8.0**	3.269	4.657	3.535	3.531
Net Heat of Combustion: (MJ/kg)	**42.8**		43.050	43.370	43.292	43.299
Cetane Index: (calculated)	**Report**		39.1	45.9	42.8	42.8
Hydrogen Content: (mass %)	**13.4**		13.59	14.10	13.99	14.00
Smoke Point: (mm)	**25.0**		21.0	26.0	24.4	24.6
Naphthalene: (vol %)		**3.0**	0.26	0.35	0.30	0.30
Thermal Stability:						
Change in pressure drop, mm Hg @ 275 °C		**25**	0.00	5.00	1.60	1.72
Change in pressure drop, mm Hg @ 260 °C			0.00	0.00	0.00	0.00
Existent Gum: (mg/100 mL)		**7.0**	0.40	2.00	1.74	1.73
Particulate Matter: (mg/L)		**1.0**	0.10	0.75	0.49	0.49
Filtration Time: (minutes)		**15**	4	13	5.84	5.69
Water Separation Index: (rating)	**70**		83	99	94.6	95.3
Fuel System Icing Inhibitor (FSII): (vol %)	**0.10**	**0.15**	0.10	0.14	0.123	0.126

Table 4-9: Region 7 Summary

MIL-DTL-83133 Turbine Fuel, Aviation Kerosene Types, NATO F34 (JP8)						
Property	Total Volume		213.01			
	Batch Analysis		145			
	Specification Limits		Region 8			
	Min	Max	Min	Max	Mean	Wt Mean
Total Acid Number: (mg KOH/g)		**0.015**	0.0004	0.0200	0.013	0.007
Aromatics: (vol %)		**25.0**	14.1	23.0	19.1	18.4
Sulfur Mercaptan: (mass %)		**0.002**	0.0001	0.0012	0.0007	0.0007
Sulfur, Total: (mass %)		**0.30**	0.0100	0.1800	0.096	0.113
Distillation:						
Initial Boiling Point (IBP), (°C)	**Report**		135.1	155.2	145.8	149.4
10% Recovered, (°C)		**205**	158.2	173.2	164.7	167.1
20% Recovered, (°C)	**Report**		164.3	180.6	172.2	173.9
50% Recovered, (°C)	**Report**		188.0	202.8	197.0	195.9
90% Recovered, (°C)	**Report**		231.0	258.2	246.1	242.8
Final Boiling Point (FBP), (°C)		**300**	252.7	288.7	267.1	266.7
Residue, (vol %)		**1.5**	0.20	1.50	1.05	0.90
Loss, (vol %)		**1.5**	0.00	1.50	0.86	0.71
Flash Point: (°C)	**38**		38.0	48.0	42.7	44.0
Density: (kg/L @ 15 °C)	**0.775**	**0.840**	0.7881	0.8161	0.8069	0.8017
Freezing Point: (°C)		**–47**	–55.0	–47.0	–49.6	–50.1
Viscosity: (mm²/s @ –20 °C)		**8.0**	3.339	4.5781	4.036	3.837
Net Heat of Combustion: (MJ/kg)	**42.8**		43.000	43.400	43.140	43.216
Cetane Index: (calculated)	**Report**		37.4	47.1	40.4	42.5
Hydrogen Content: (mass %)	**13.4**		13.44	14.03	13.81	13.77
Smoke Point: (mm)	**25.0**		20.0	26.0	21.5	22.7
Naphthalene: (vol %)		**3.0**	0.10	2.88	1.98	1.51
Thermal Stability:						
Change in pressure drop, mm Hg @ 275 °C		**25**	0.00	3.30	0.24	0.20
Change in pressure drop, mm Hg @ 260 °C			NR	NR	NR	NR
Existent Gum: (mg/100 mL)		**7.0**	0.00	3.00	1.12	0.93
Particulate Matter: (mg/L)		**1.0**	0.03	1.00	0.31	0.43
Filtration Time: (minutes)		**15**	3	12	4.94	5.11
Water Separation Index: (rating)	**70**		78	100	94.4	93.0
Fuel System Icing Inhibitor (FSII): (vol %)	**0.10**	**0.15**	0.10	0.15	0.123	0.121

Table 4-10: Region 8 Summary

4. JP8—Assessment Summary

Overview:

In 2012, 1,373 reported analyses, representing 1,723.48 million U.S. gallons of JP8, were processed by Regions 1–8. This represents a decrease from the 1,544 reported analyses and 1,826.26 million U.S. gallons queried from the PQIS in 2011.

Significant Trending:

Flash Point. The weighted mean decreased 1.0 °C from 2009 to 2012.

Freezing Point. The weighted mean increased 1.1 °C from 2011 to 2012 after having decreased 1.6 °C from 2009 to 2011.

Viscosity. The weighted mean increased 0.065 mm^2/s @ −20 °C from 2011 to 2012 after having decreased 0.082 mm^2/s @ −20 °C from 2009 to 2011.

Smoke Point. The weighted mean decreased 0.53 mm from 2010 to 2012.

JP8 Observations:

All batches met specification requirements in 2012.

For **Total Acid Number**, a waiver was granted for a 0.020 mg KOH/g maximum limit for locations in Alaska. Seventy-nine measurements from Alaska were greater than the maximum specification limit of 0.015 mg KOH/g, but all met the specification limit set by the waiver. These data are included in the data tables and figures.

Six **Smoke Point** values were less than the minimum JP8 specification limit of 19.0 mm (when naphthalene values are less than 3.0 volume percent). Waivers were granted for these values. These data points are included in the data tables and figures.

In September 2012, **FSII** specification limits changed to 0.07-0.10 vol % because of the publication of MIL-DTL-83133 with amendment 1, but contracts through the end of 2012 all fell under the MIL-DTL-83133H (without amendment 1) revision.

For **Water Separation Index**, all JP8 batches met specification requirements. The impact of additives provides for a wide variation (see Table 4-11). Batches were not separated by type of additives or group of additives for this reporting. The minimum Micro Separometer (MSEP) rating shall be as follows:

JP8 Additives	MSEP Rating, min
Antioxidant (AO), Metal Deactivator (MDA)	90
AO, MDA, and Fuel System Icing Inhibitor (FSII)	85
AO, MDA, and Corrosion Inhibitor/Lubricity Improver (CI/LI)	80
AO, MDA, FSII and CI/LI	70

Table 4-11: JP8 Additives and Associated MSEP Ratings

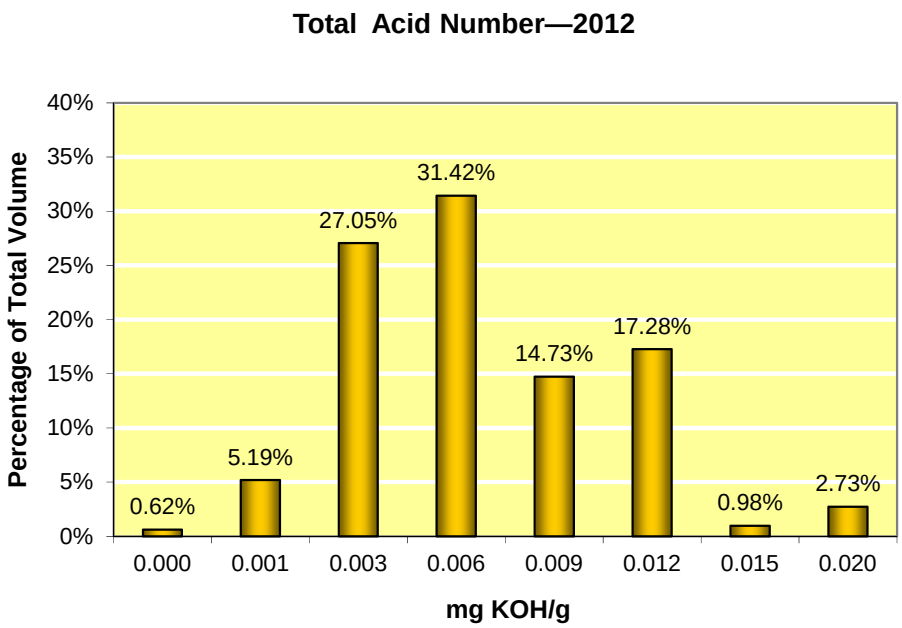


Figure 4-1: Total Acid Number (mg KOH/g), maximum 0.015

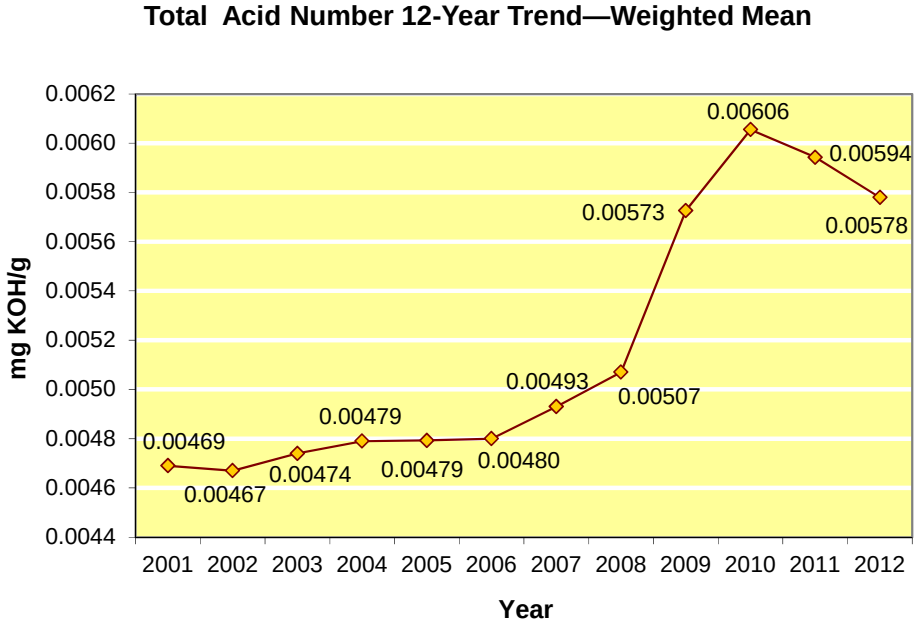


Figure 4-2: Total Acid Number (mg KOH/g), 12-Year Trend, maximum 0.015

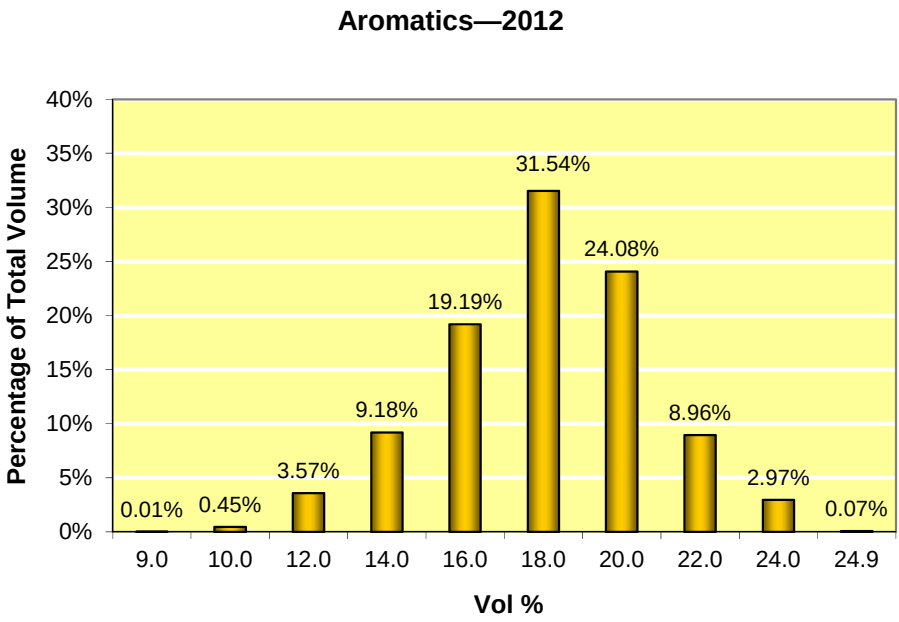


Figure 4-3: Aromatics (vol %), maximum 25.0

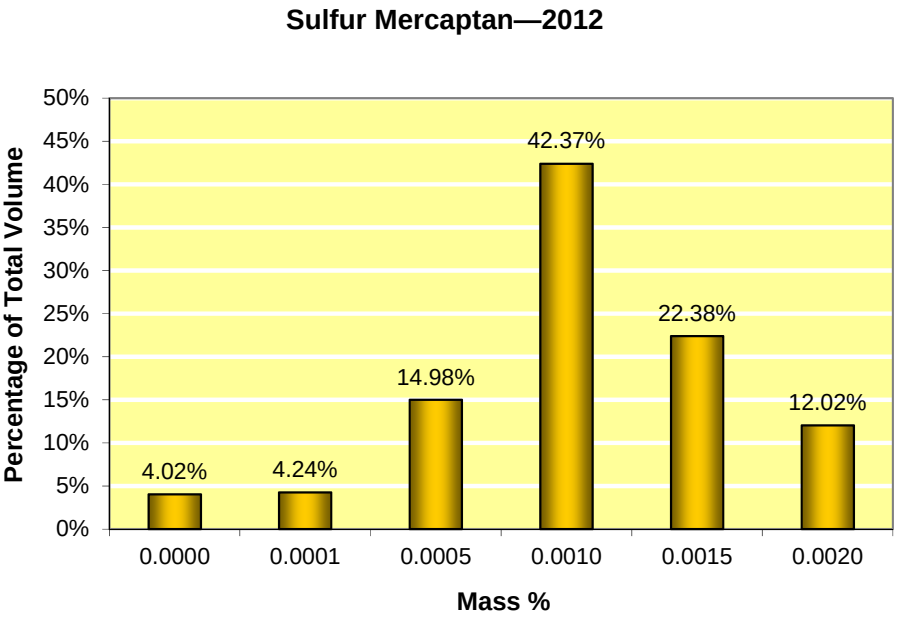


Figure 4-4: Sulfur Mercaptan (mass %), maximum 0.002

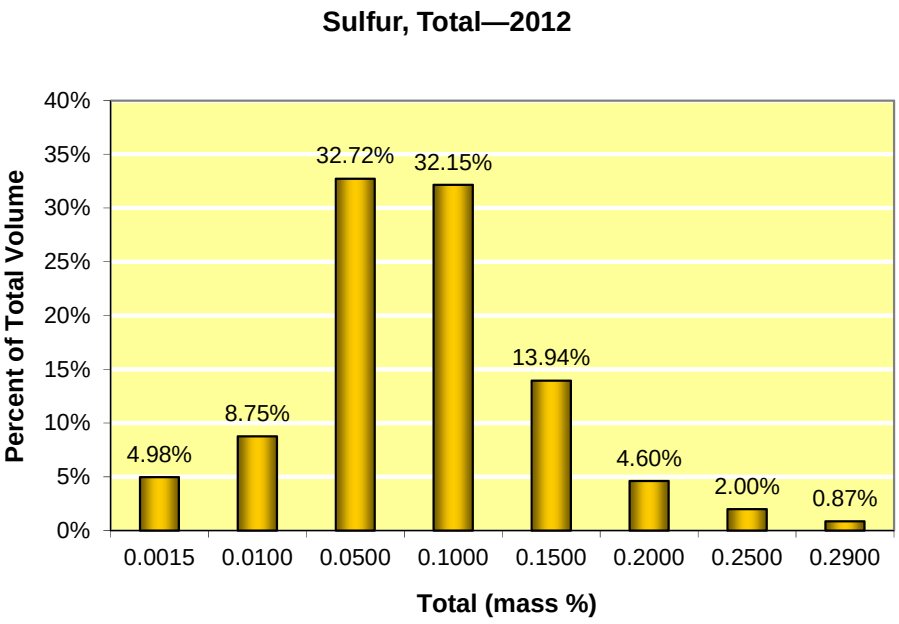


Figure 4-5: Sulfur, Total (mass %), maximum 0.30

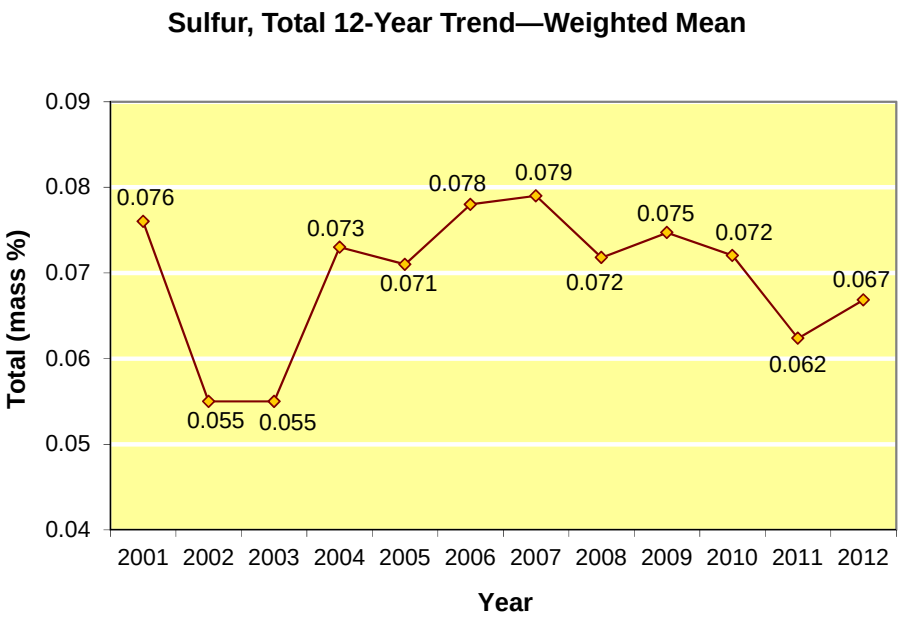


Figure 4-6: Sulfur, Total (mass %), 12-Year Trend, maximum 0.30

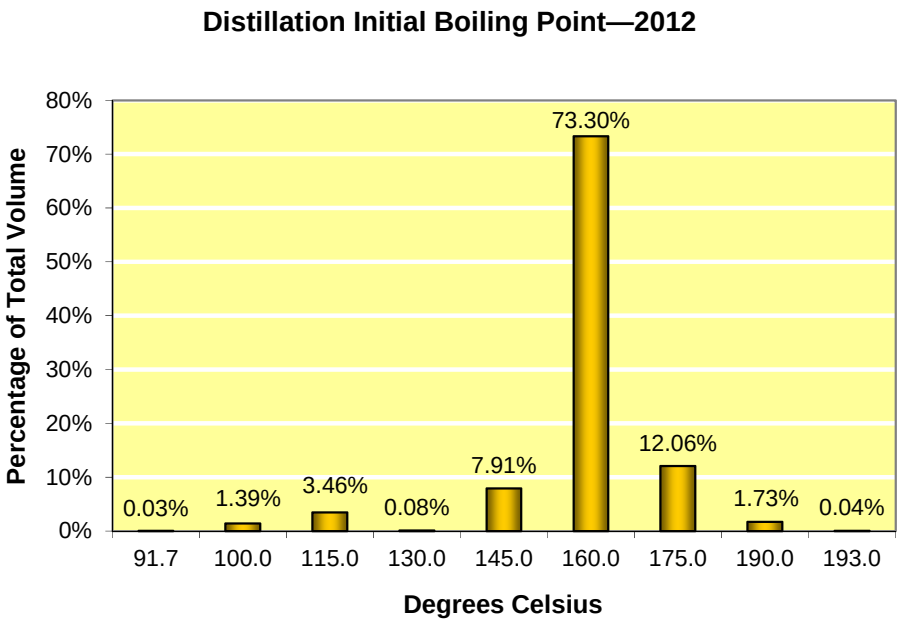


Figure 4-7: Distillation Initial Boiling Point (°C), Report

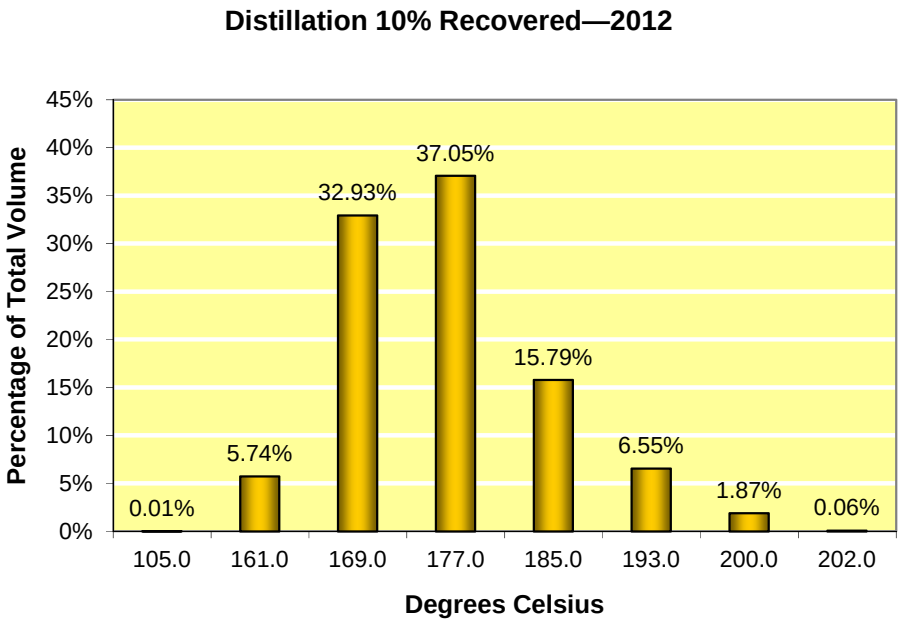


Figure 4-8: Distillation 10% Recovered (°C), maximum 205

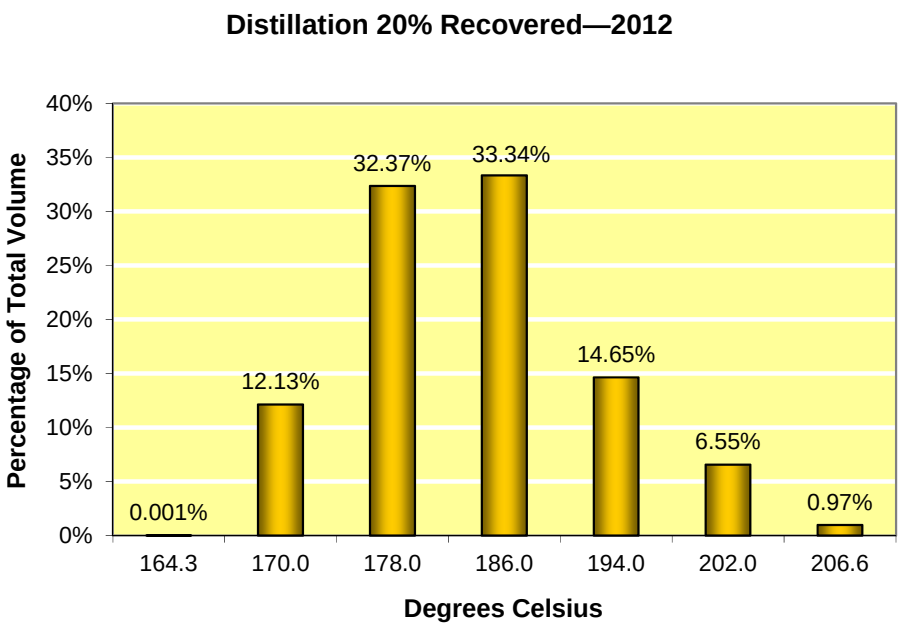


Figure 4-9: Distillation 20% Recovered (°C), Report

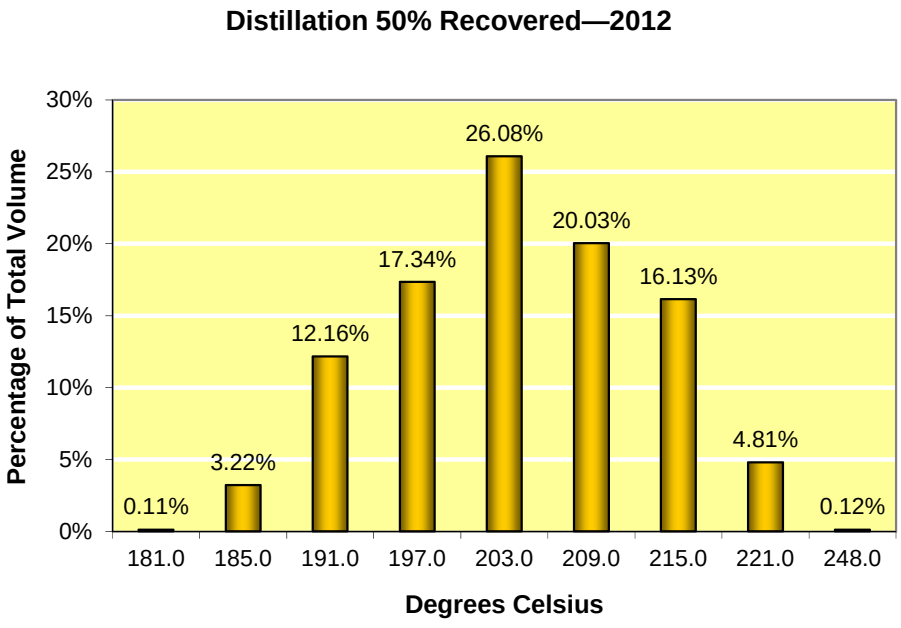


Figure 4-10: Distillation 50% Recovered (°C), Report

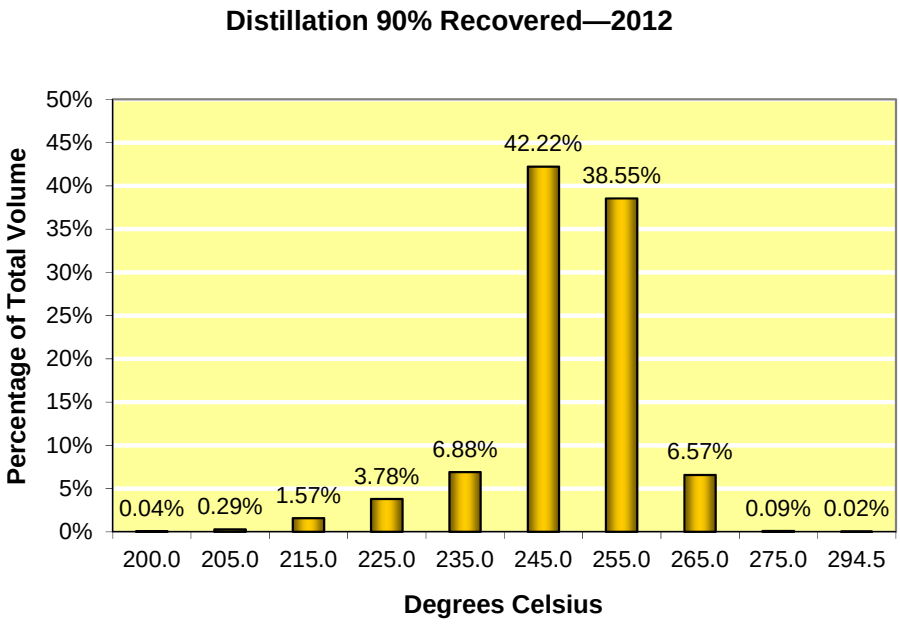


Figure 4-11: Distillation 90% Recovered (°C), Report

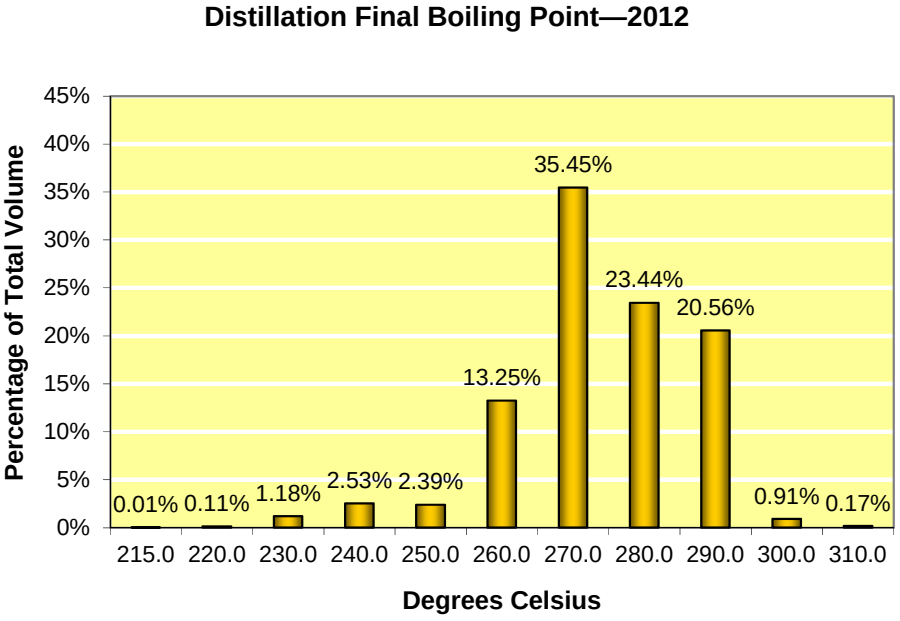


Figure 4-12: Distillation Final Boiling Point (°C), maximum 300

Note: Six values were greater than the maximum limit of 300, but all were acceptable as these six values were procured under a prior specification and did not exceed the old D2887 maximum limit.

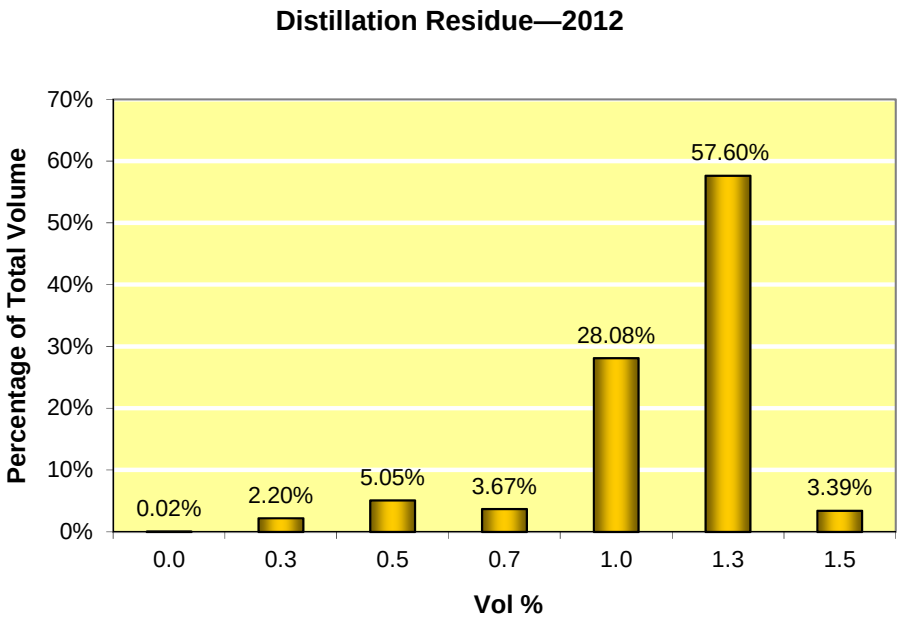


Figure 4-13: Distillation Residue (vol %), maximum 1.5

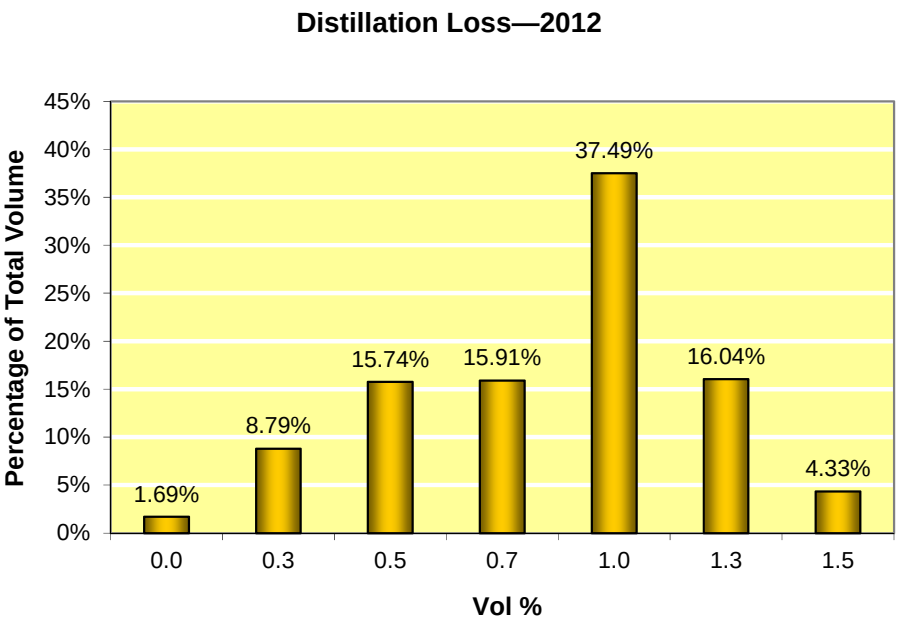


Figure 4-14: Distillation Loss (vol %), maximum 1.5

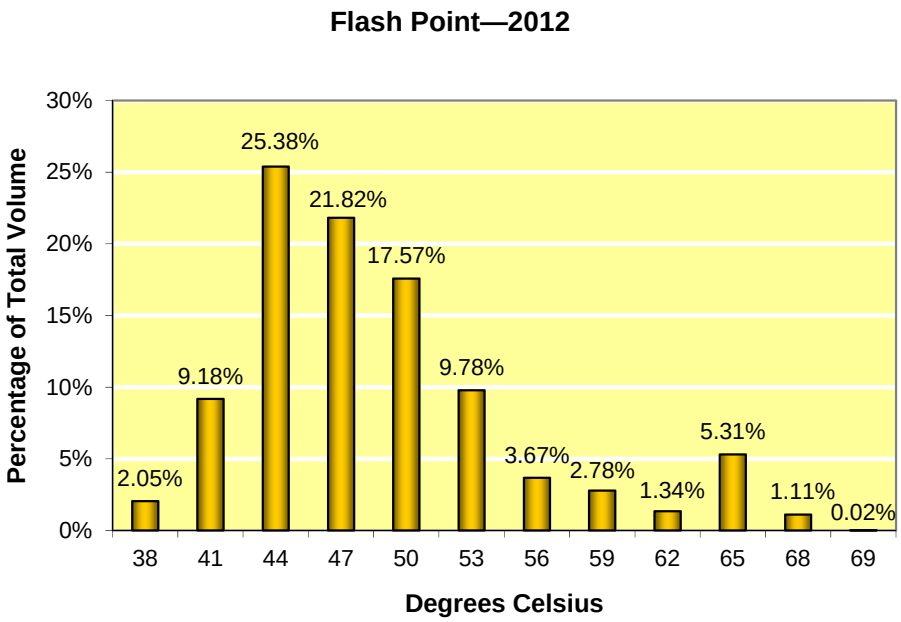


Figure 4-15: Flash Point (°C), minimum 38

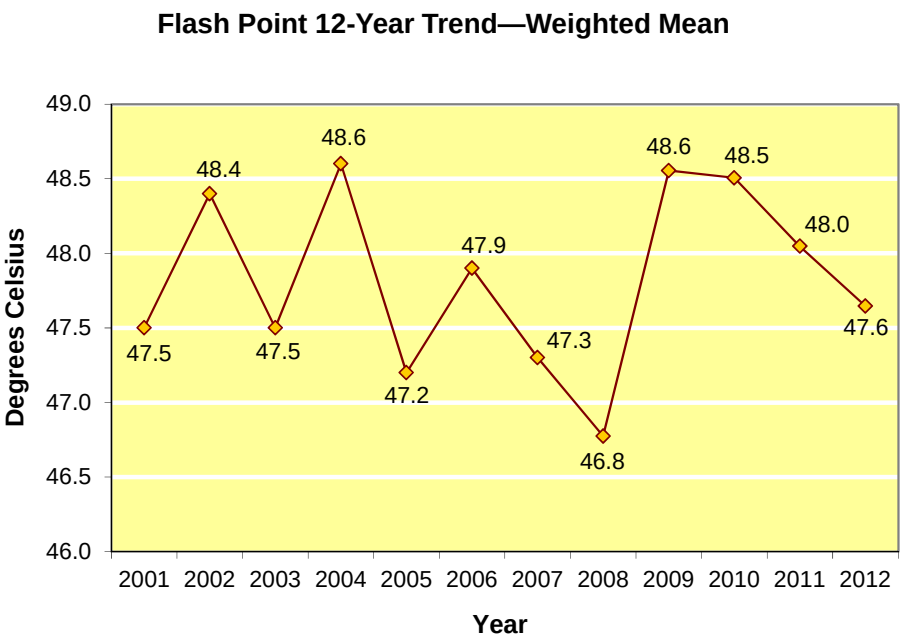


Figure 4-16: Flash Point (°C), 12-Year Trend, minimum 38

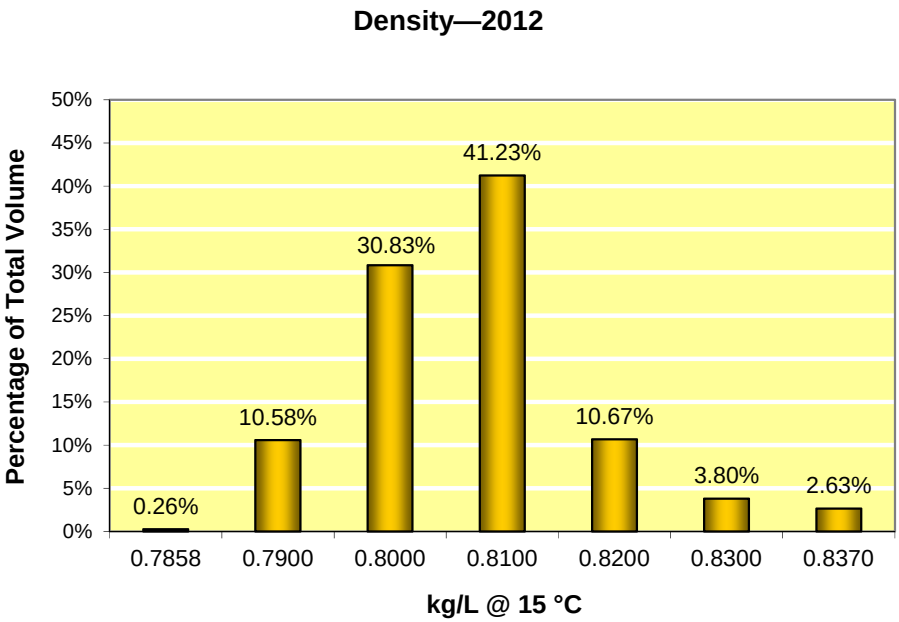


Figure 4-17: Density (kg/L @ 15 °C), minimum 0.775, maximum 0.840

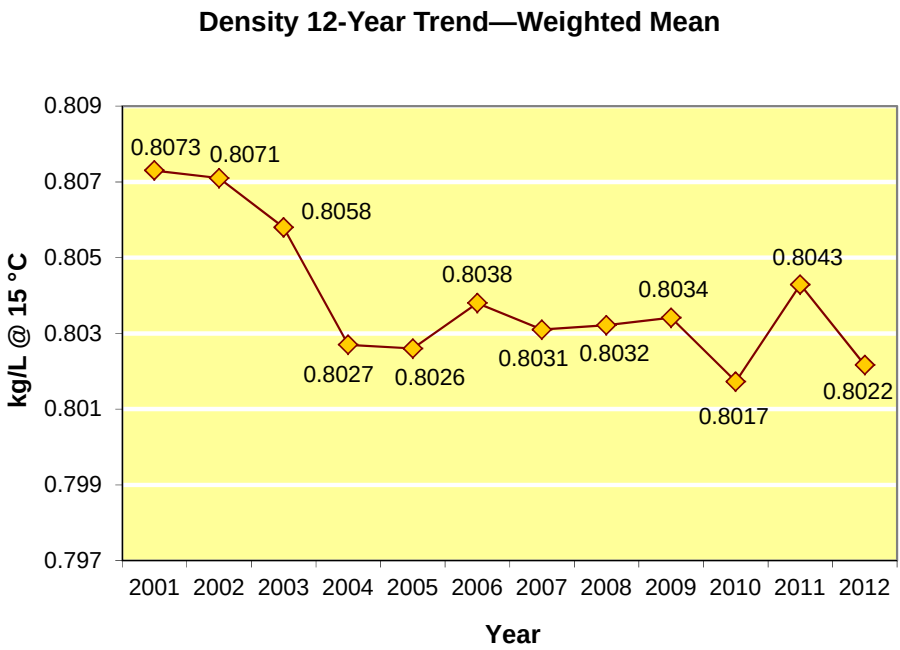


Figure 4-18: Density (kg/L @ 15 °C), 12-Year Trend, minimum 0.775, maximum 0.840

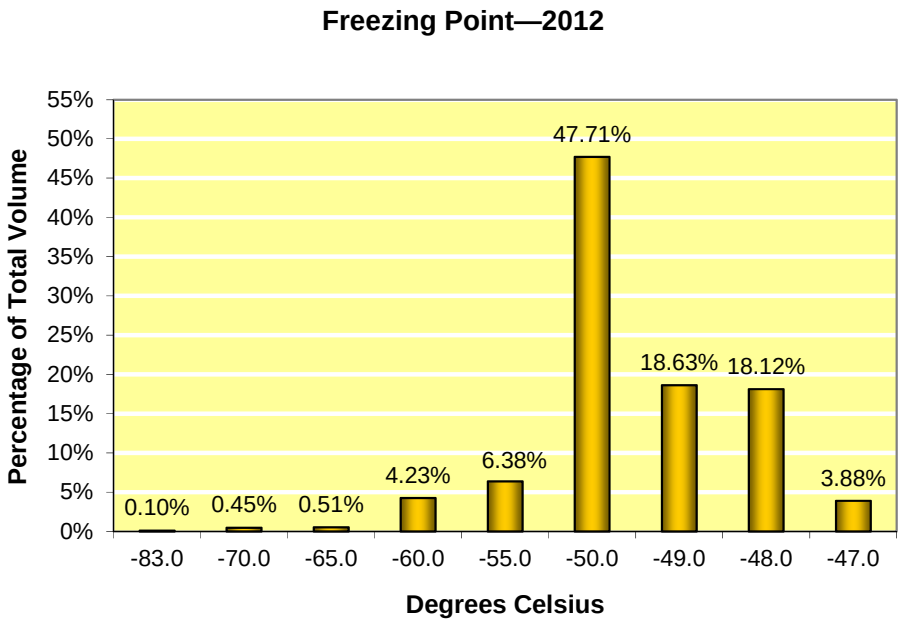


Figure 4-19: Freezing Point (°C), maximum –47

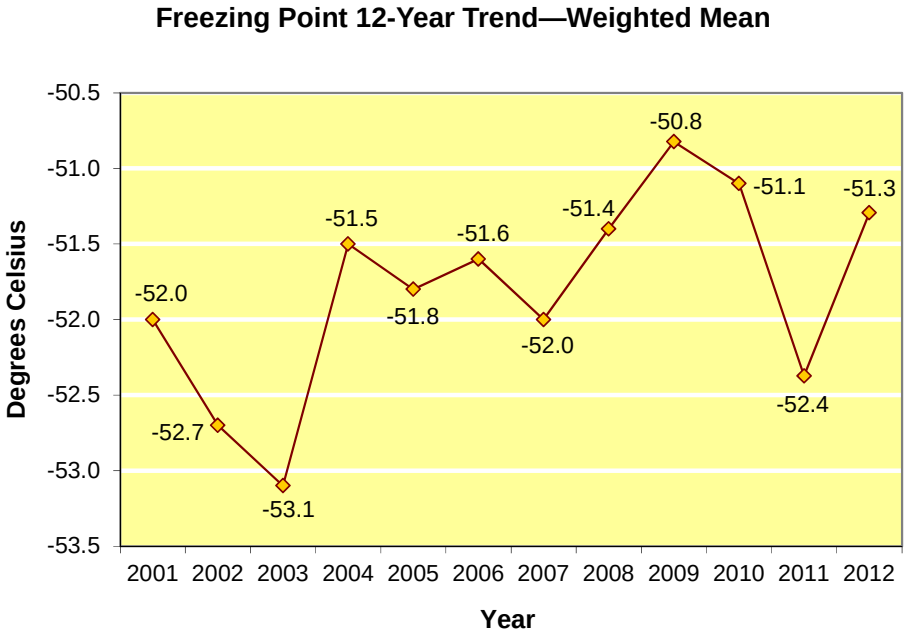


Figure 4-20: Freezing Point (°C), 12-Year Trend, maximum –47

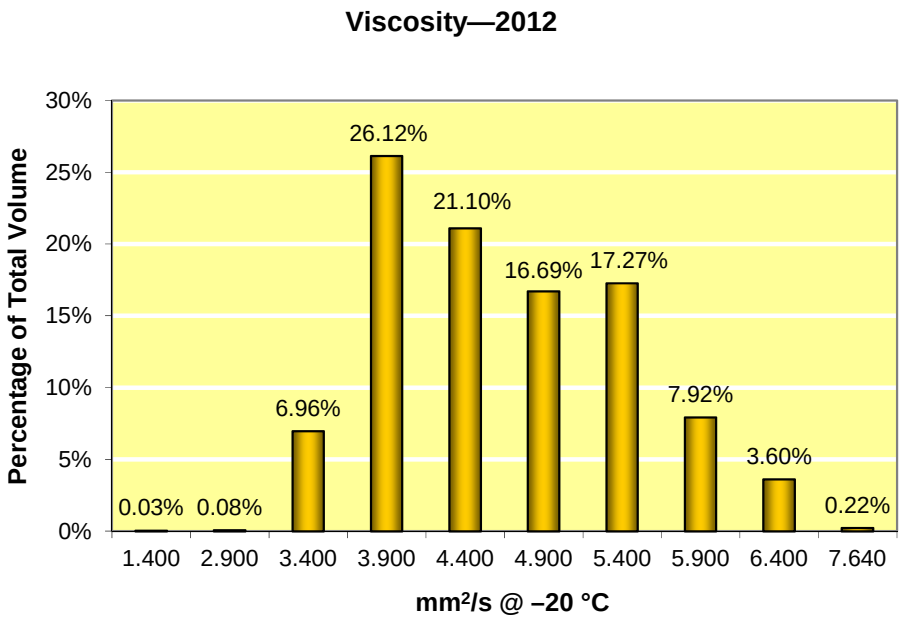


Figure 4-21: Viscosity (mm^2/s @ –20 °C), maximum 8.0

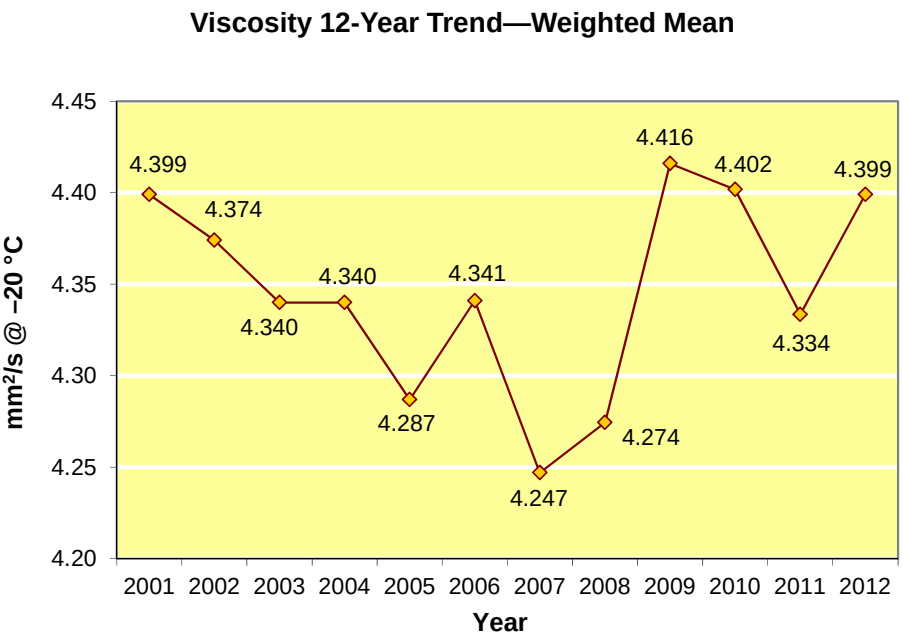


Figure 4-22: Viscosity (mm^2/s @ –20 °C), 12-Year Trend, maximum 8.0

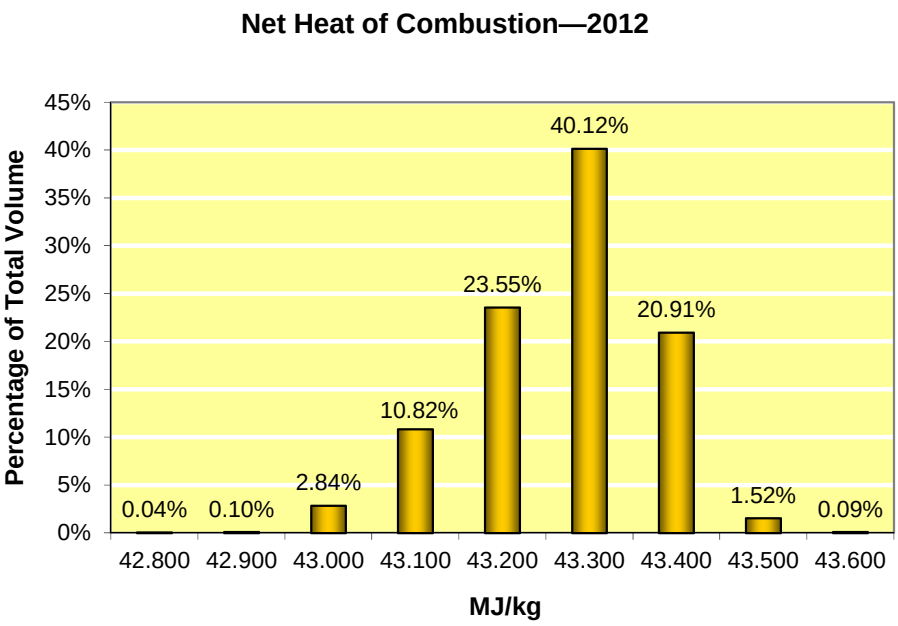


Figure 4-23: Net Heat of Combustion (MJ/kg), minimum 42.8

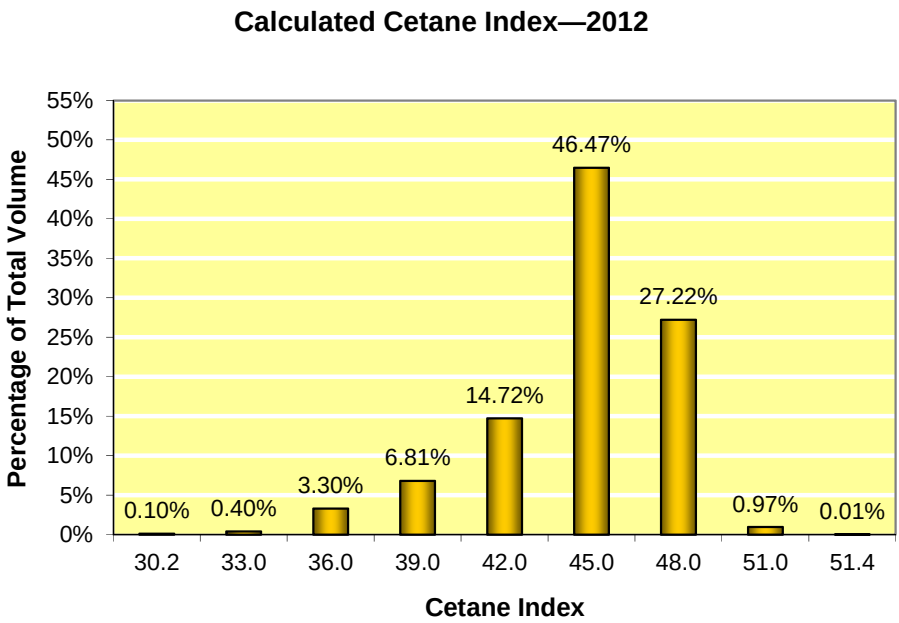


Figure 4-24: Calculated Cetane Index, Report

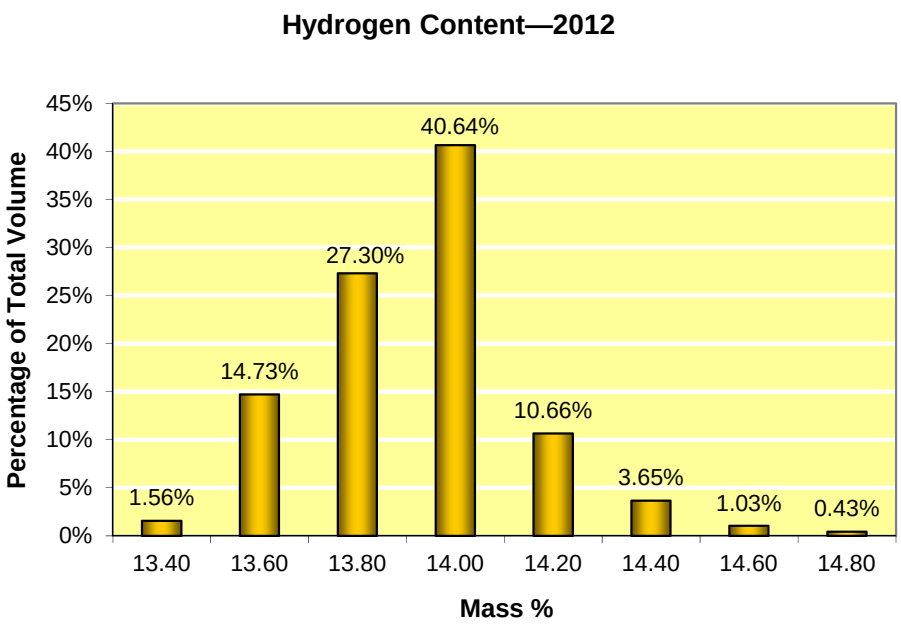


Figure 4-25: Hydrogen Content (mass %), minimum 13.4

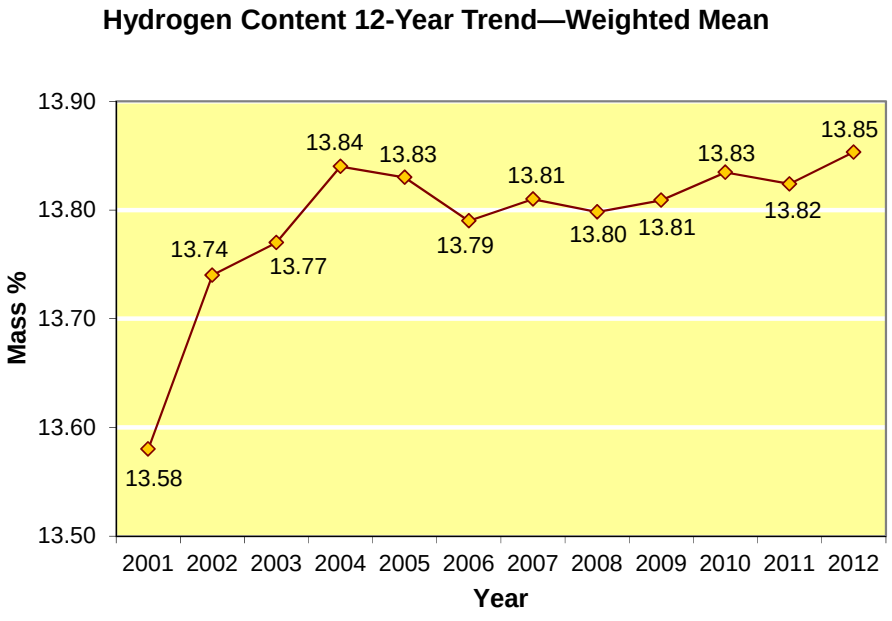


Figure 4-26: Hydrogen Content (mass %), 12-Year Trend, minimum 13.4

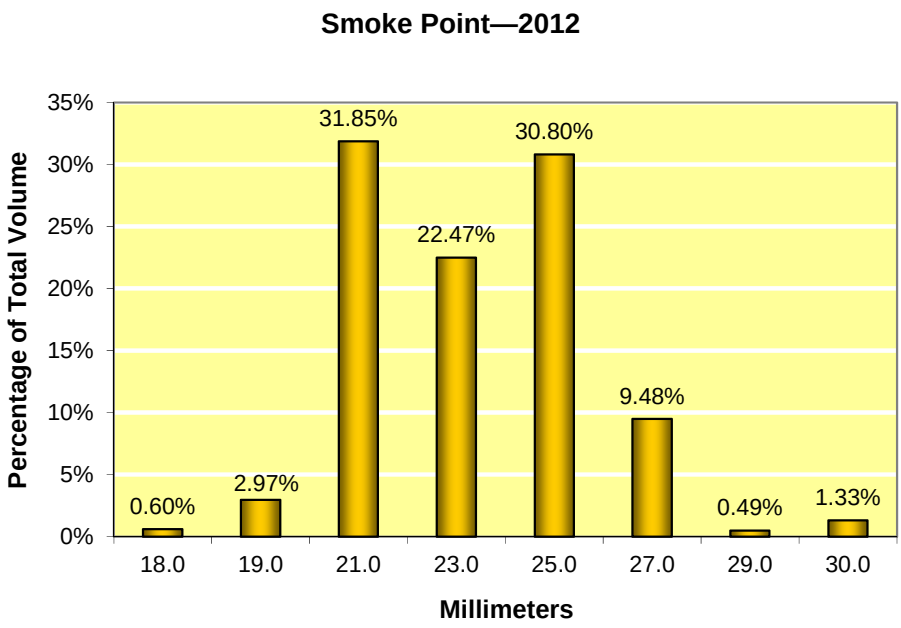


Figure 4-27: Smoke Point (mm), minimum 25.0

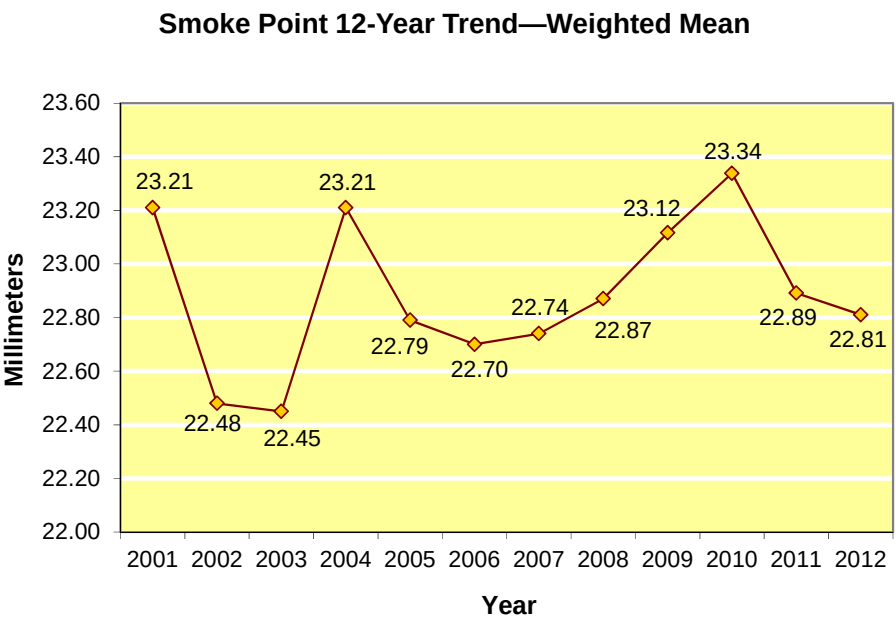


Figure 4-28: Smoke Point (mm), 12-Year Trend, minimum 25.0

Note: When the smoke point result is below 25 mm, the product is acceptable so long as the naphthalene content is below 3.0 percent and the smoke point is above the minimum of 19 mm. Waivers were granted for the smoke point values below 19 mm.

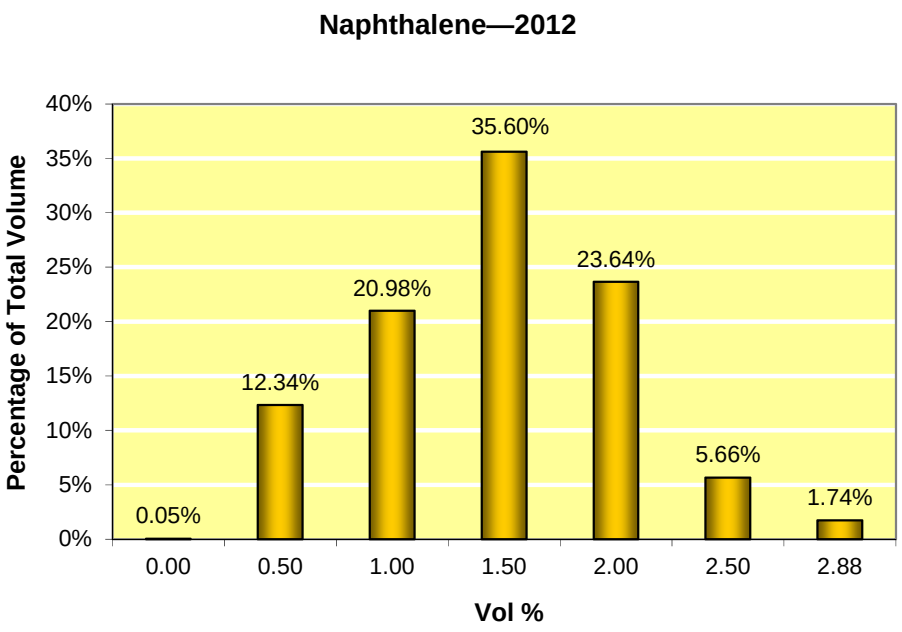


Figure 4-29: Naphthalene (vol %), maximum 3.0

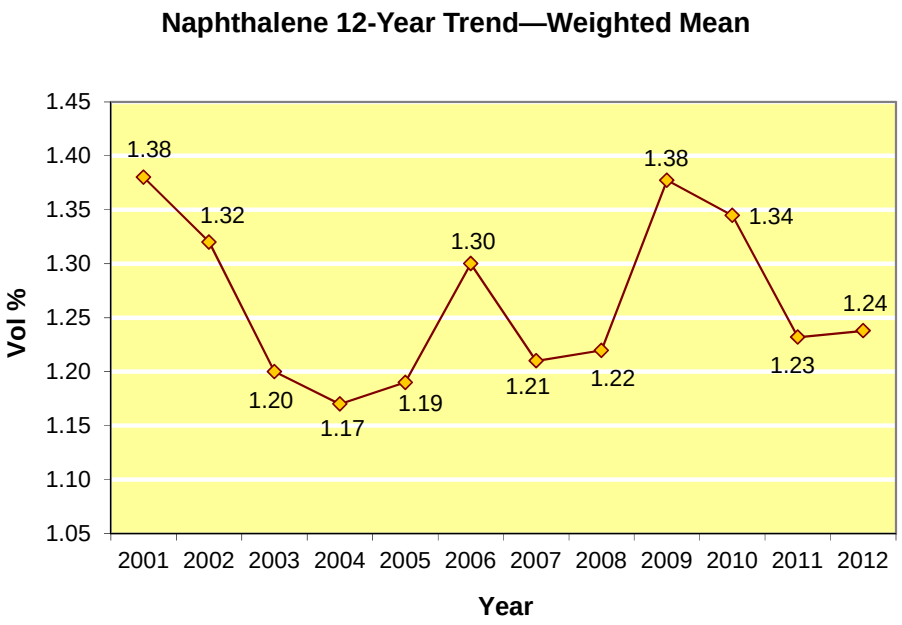


Figure 4-30: Naphthalene (vol %), 12-Year Trend, maximum 3.0

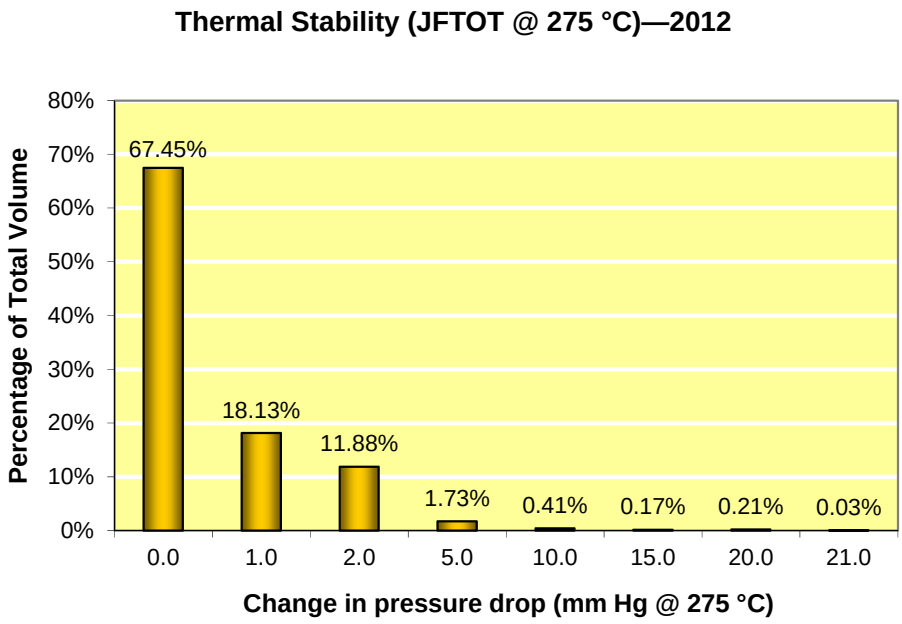


Figure 4-31: Thermal Stability, Change in Pressure Drop (mm Hg @ 275 °C), maximum 25

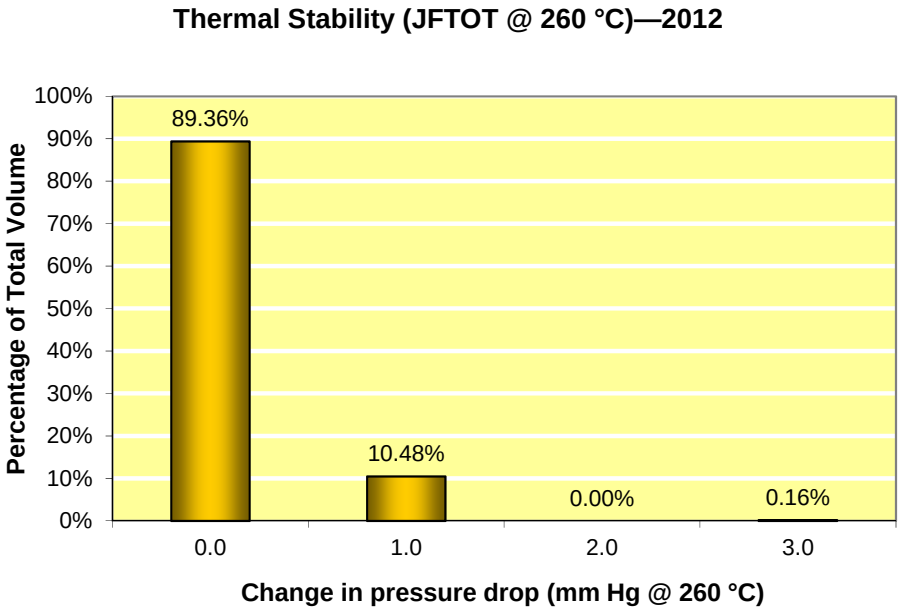


Figure 4-32: Thermal Stability, Change in Pressure Drop (mm Hg @ 260 °C), maximum 25

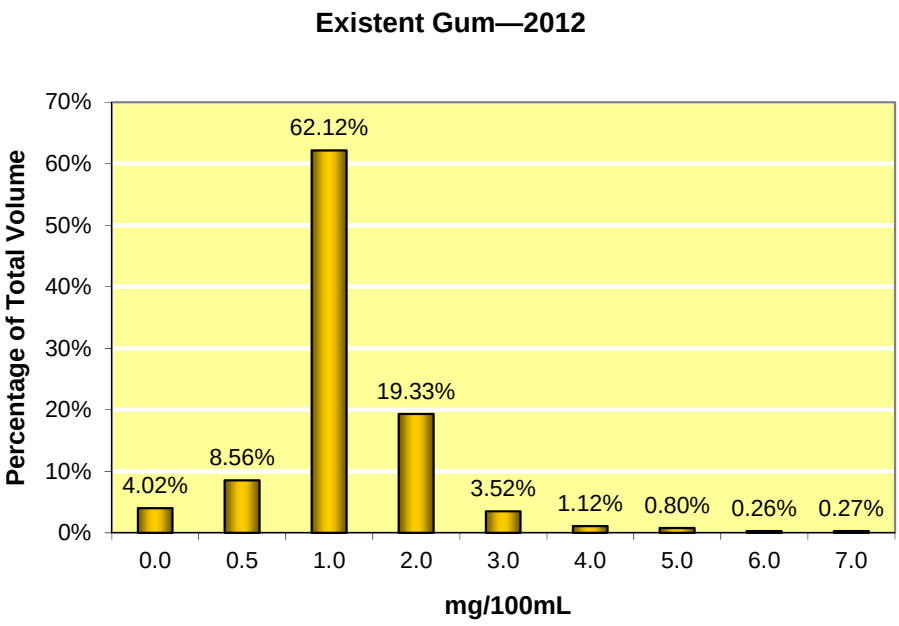


Figure 4-33: Existent Gum (mg/100 mL), maximum 7.0

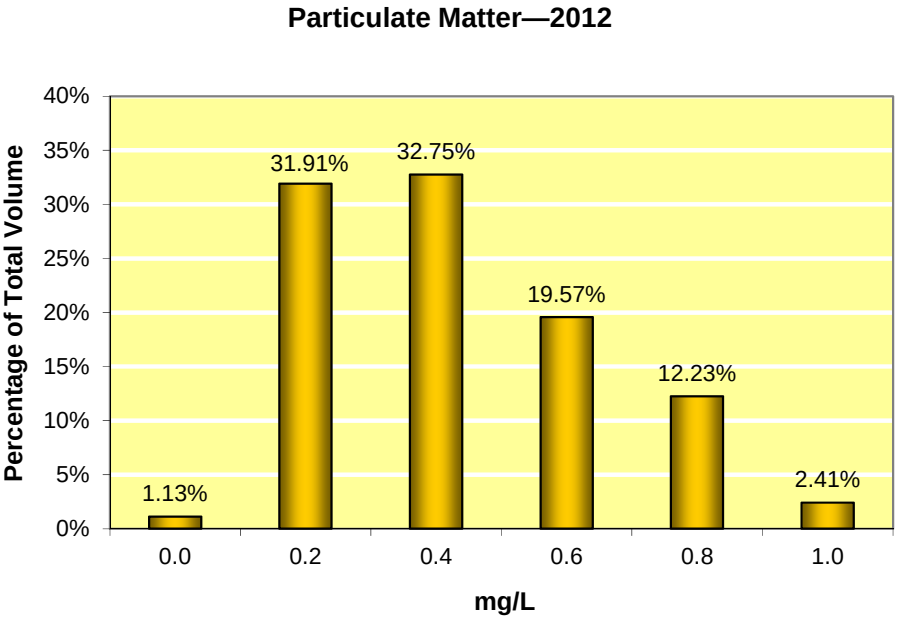


Figure 4-34: Particulate Matter (mg/L), maximum 1.0

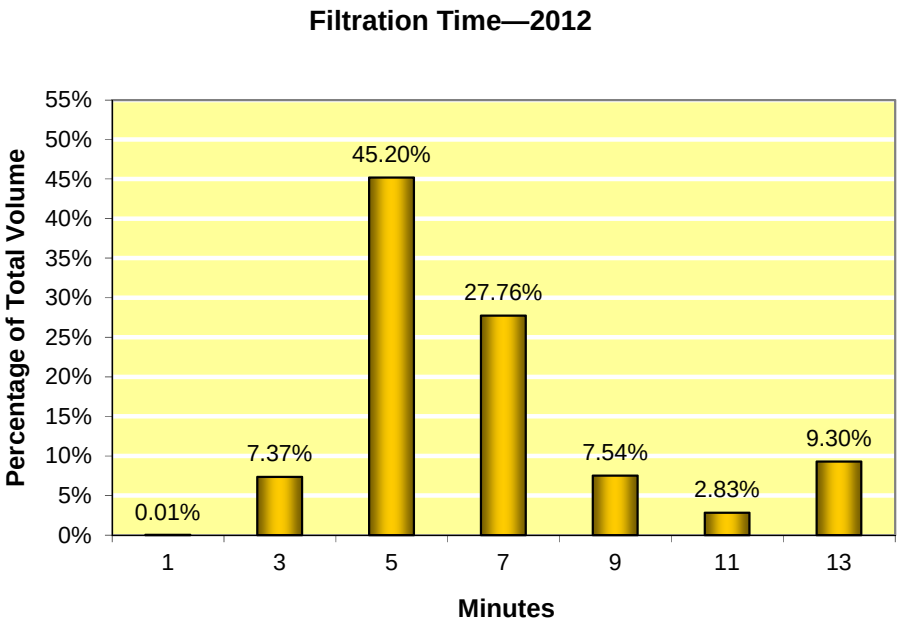


Figure 4-35: Filtration Time (minutes), maximum 15

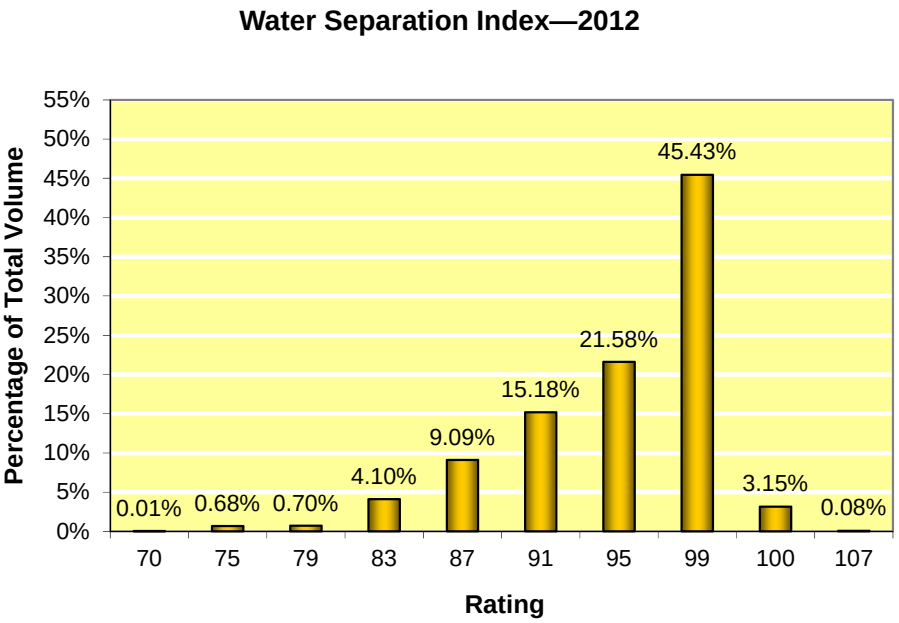


Figure 4-36: Water Separation Index (rating), minimum 70

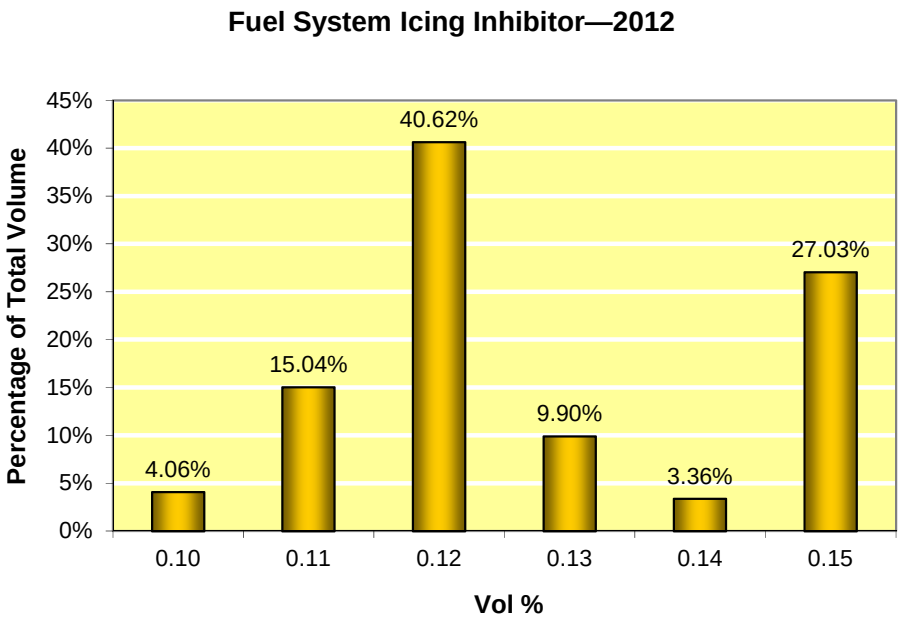


Figure 4-37: Fuel System Icing Inhibitor (vol %), minimum 0.10, maximum 0.15

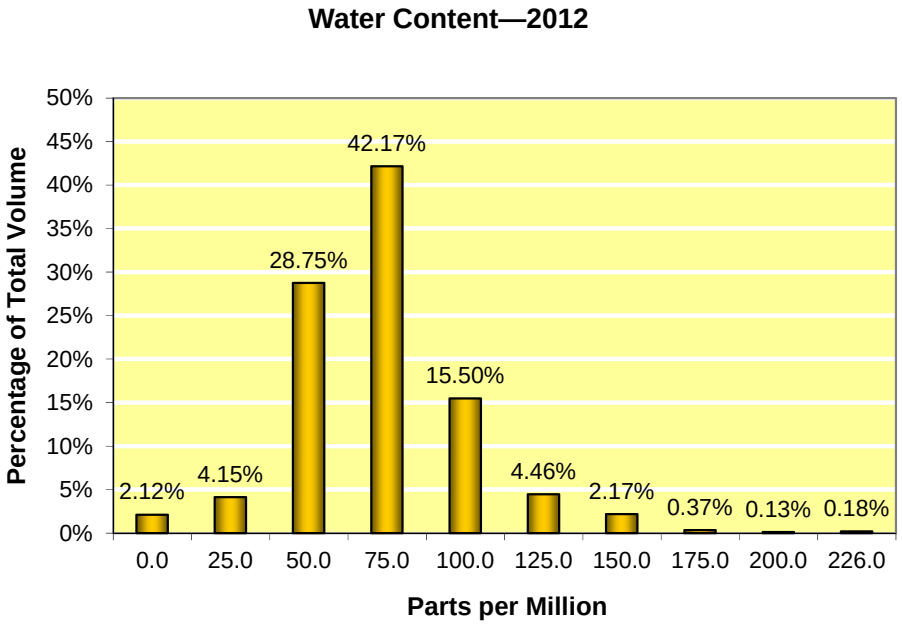


Figure 4-38: Water Content—2012

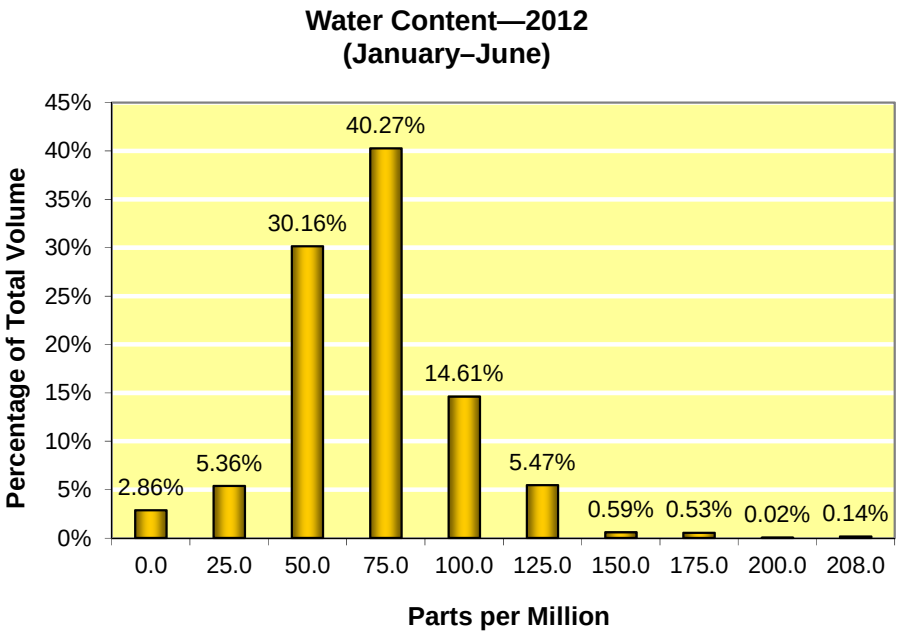


Figure 4-39: Water Content, January–June 2012

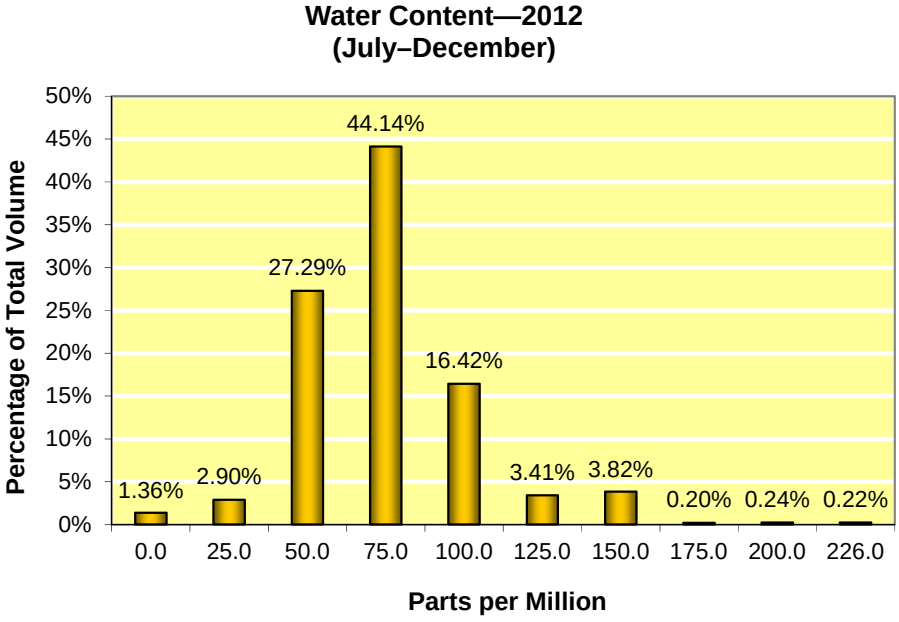


Figure 4-40: Water Content, July–December 2012

5. JP5—2012 Data Summary

MIL-DTL-5624 Turbine Fuel, Aviation, Grade JP5 (NATO Code F-44)			
Property	**2012 Source Inputs**		
	Region	**Volume**	**Analysis**
Total Acid Number: (mg KOH/g)	All	407.12	171
Aromatics: (vol %)	All	407.12	171
Sulfur, Total: (mass %)	All	407.12	171
Sulfur, Mercaptan: (mass %)	All	302.15	112
Distillation Temperature:			
Initial Boiling Point, (°C)	All	409.64	172
10% Recovered, (°C)	All	409.64	172
20% Recovered, (°C)	All	409.64	172
50% Recovered, (°C)	All	409.64	172
90% Recovered, (°C)	All	409.64	172
End Point, (°C)	All	409.64	172
Residue, (vol %)	All	179.13	95
Loss, (vol %)	All	179.13	95
Flash Point: (°C)	All	409.64	172
Density: (kg/L @ 15 °C)	All	407.54	171
Freezing Point: (°C)	All	409.64	172
Viscosity: (mm^2/s @ –20 °C)	All	407.12	171
Heating Value, Heat of combustion: (MJ/kg)	All	392.26	167
Cetane Index: (calculated)	All	407.12	171
Hydrogen Content: (mass %)	All	392.78	159
Smoke Point: (mm)	All	407.12	171
Thermal Stability: Change in pressure drop, mm Hg @ 275 °C	All	407.12	171
Existent Gum: (mg/100 mL)	All	409.64	172
Particulate Matter: (mg/L)	All	409.64	172
Filtration Time: (minutes)	All	409.64	172
MSEP: (rating)	All	407.54	171
Fuel System Icing Inhibitor (FSII): (vol %)	All	60.14	24

Table 5-1: Data Summary, MIL-DTL-5624 Turbine Fuel, Aviation, Grade JP5 (NATO Code F-44), 2012 Source Inputs

MIL-DTL-5624 Turbine Fuel, Aviation, Grade JP5 (NATO Code F-44)						
Property	**Specification Limits**		**2012 Test Results**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Total Acid Number: (mg KOH/g)		**0.015**	0.0010	0.0200	0.0052	0.0054
Aromatics: (vol %)		**25.0**	9.4	24.0	18.13	18.23
Sulfur, Total:[1] (mass %)		**0.30**	0.0010	0.1910	0.090	0.103
Sulfur, Mercaptan:[2] (mass %)		**0.002**	0.0000	0.0016	0.0012	0.0012
Distillation Temperature:						
Initial Boiling Point, (°C)	**Report**		136.0	187.0	163.0	158.5
10% Recovered,[3] (°C)		**205(186)**	168.0	200.0	184.1	181.2
20% Recovered, (°C)	**Report**		179.0	206.0	193.0	191.0
50% Recovered, (°C)	**Report**		193.0	226.0	213.3	212.5
90% Recovered, (°C)	**Report**		217.8	256.0	243.8	244.5
End Point,[3] (°C)		**300(330)**	233.9	277.0	264.4	265.6
Residue, (vol %)		**1.5**	0.5	1.4	1.0	1.0
Loss, (vol %)		**1.5**	0.2	1.5	1.0	1.0
Flash Point: (°C)	**60**		61.0	68.0	63.2	63.3
Density: (kg/L @ 15 °C)	**0.788**	**0.845**	0.7964	0.8299	0.8137	0.8123
Freezing Point: (°C)		**–46**	–80.0	–46.3	–50.7	–50.1
Viscosity: (mm²/s @ –20 °C)		**8.5**	3.749	6.980	5.299	5.182
Heating Value, Heat of combustion: (MJ/kg)	**42.6**		43.000	43.354	43.142	43.145
Cetane Index: (calculated)	**Report**		39.22	48.60	44.2	44.4
Hydrogen Content: (mass %)	**13.4**		13.40	14.68	13.95	14.01
Smoke Point: (mm)	**19.0**		20.0	27.0	22.0	22.3
Thermal Stability:						
Change in pressure drop, mm Hg @ 275 °C		**25**	0.00	2.00	0.16	0.12
Existent Gum: (mg/100 mL)		**7.0**	0.0	3.6	1.03	1.02
Particulate Matter: (mg/L)		**1.0**	0.00	0.90	0.24	0.24
Filtration Time: (minutes)		**15**	2	7	3.47	3.33
MSEP: (rating)	**70**		73	100	91.3	90.5
Fuel System Icing Inhibitor (FSII): (vol %)	**0.10**	**0.15**	0.100	0.150	0.116	0.117

Table 5-2: Data Summary, MIL-DTL-5624 Turbine Fuel, Aviation, Grade JP5 (NATO Code F-44), 2012 Test Results

Note 1: The clause for procurement states a maximum of 0.20 mass % for sulfur, total, for JP5, but the specification limit for sulfur, total, is a maximum of 0.30 mass %.
Note 2: The sulfur, mercaptan limit or negative doctor test result is acceptable to meet the specification requirement.
Note 3: Test method D2887 limits in parentheses (°C).

5. JP5—2012 Regional Data Summary

MIL-DTL-5624 Turbine Fuel, Aviation, Grade JP5 (NATO Code F-44)						
Property	Total Volume		234.76			
	Batch Analysis		79			
	Specification Limits		Region 3			
	Min	Max	Min	Max	Mean	Wt Mean
Total Acid Number: (mg KOH/g)		**0.015**	0.0020	0.0120	0.0060	0.0060
Aromatics: (vol %)		**25.0**	14.5	20.4	18.53	18.54
Sulfur, Total: (mass %)		**0.30**	0.0910	0.1848	0.135	0.135
Sulfur, Mercaptan: (mass %)		**0.002**	0.00078	0.0016	0.0013	0.0013
Distillation Temperature:						
Initial Boiling Point, (°C)	**Report**		136.0	181.0	142.6	142.2
10% Recovered, (°C)		**205**(186)	168.0	195.0	172.2	171.9
20% Recovered, (°C)	**Report**		179.0	202.0	185.0	184.8
50% Recovered, (°C)	**Report**		193.0	219.0	212.4	212.3
90% Recovered, (°C)	**Report**		244.0	256.0	249.9	249.9
End Point, (°C)		**300**(330)	264.0	277.0	270.8	270.8
Residue, (vol %)		**1.5**	1.0	1.2	1.1	1.1
Loss, (vol %)		**1.5**	1.3	1.4	1.4	1.3
Flash Point: (°C)	**60**		61.0	67.0	63.9	63.8
Density: (kg/L @ 15 °C)	**0.788**	**0.845**	0.8033	0.8162	0.8107	0.8108
Freezing Point: (°C)		**–46**	–56.7	–46.3	–49.1	–49.1
Viscosity: (mm²/s @ –20 °C)		**8.5**	3.749	5.874	5.000	4.997
Heating Value, Heat of combustion: (MJ/kg)	**42.6**		43.066	43.354	43.146	43.143
Cetane Index: (calculated)	**Report**		39.22	48.60	44.9	44.8
Hydrogen Content: (mass %)	**13.4**		13.74	14.68	14.18	14.18
Smoke Point: (mm)	**19.0**		20.0	27.0	22.8	22.8
Thermal Stability: Change in pressure drop, mm Hg @ 275 °C		**25**	0.00	1.00	0.04	0.04
Existent Gum: (mg/100 mL)		**7.0**	0.0	2.0	1.03	1.04
Particulate Matter: (mg/L)		**1.0**	0.03	0.64	0.15	0.15
Filtration Time: (minutes)		**15**	2	7	3.10	3.11
MSEP: (rating)	**70**		73	98	87.5	88.0
Fuel System Icing Inhibitor (FSII): (vol %)	**0.10**	**0.15**	NR	NR	NR	NR

Table 5-3: Region 3 Summary

MIL-DTL-5624 Turbine Fuel, Aviation, Grade JP5 (NATO Code F-44)						
Property	Total Volume		106.52			
	Batch Analysis		61			
	Specification Limits		Region 5			
	Min	Max	Min	Max	Mean	Wt Mean
Total Acid Number: (mg KOH/g)		**0.015**	0.0010	0.0120	0.0044	0.0046
Aromatics: (vol %)		**25.0**	9.4	19.7	16.88	16.79
Sulfur, Total: (mass %)		**0.30**	0.0100	0.0600	0.031	0.031
Sulfur, Mercaptan: (mass %)		**0.002**	0.0010	0.0010	0.0010	0.0010
Distillation Temperature:						
Initial Boiling Point, (°C)	**Report**		174.0	186.0	180.6	180.6
10% Recovered, (°C)		**205**(186)	193.0	200.0	195.4	195.4
20% Recovered, (°C)	**Report**		199.0	206.0	202.2	202.2
50% Recovered, (°C)	**Report**		210.0	226.0	218.3	218.3
90% Recovered, (°C)	**Report**		232.0	253.0	242.6	242.3
End Point, (°C)		**300**(330)	252.0	272.0	262.7	262.6
Residue, (vol %)		**1.5**	0.5	1.2	1.0	1.0
Loss, (vol %)		**1.5**	0.2	1.5	1.0	0.9
Flash Point: (°C)	**60**		61.0	68.0	62.2	62.1
Density: (kg/L @ 15 °C)	**0.788**	**0.845**	0.8115	0.8299	0.8214	0.8215
Freezing Point: (°C)		**–46**	–56.0	–47.0	–50.4	–50.6
Viscosity: (mm²/s @ –20 °C)		**8.5**	5.280	6.980	6.014	6.010
Heating Value, Heat of combustion: (MJ/kg)	**42.6**		43.000	43.300	43.121	43.120
Cetane Index: (calculated)	**Report**		40.20	45.90	43.1	43.1
Hydrogen Content: (mass %)	**13.4**		13.50	14.00	13.74	13.73
Smoke Point: (mm)	**19.0**		20.0	23.0	20.5	20.5
Thermal Stability: Change in pressure drop, mm Hg @ 275 °C		**25**	0.00	1.00	0.18	0.14
Existent Gum: (mg/100 mL)		**7.0**	0.0	3.6	0.95	0.91
Particulate Matter: (mg/L)		**1.0**	0.00	0.80	0.22	0.24
Filtration Time: (minutes)		**15**	3	4	3.41	3.41
MSEP: (rating)	**70**		89	100	96.7	96.6
Fuel System Icing Inhibitor (FSII): (vol %)	**0.10**	**0.15**	NR	NR	NR	NR

Table 5-4: Region 5 Summary

5. JP5—2012 Regional Data Summary

MIL-DTL-5624 Turbine Fuel, Aviation, Grade JP5 (NATO Code F-44)						
Property	**Total Volume**		**24.07**			
	Batch Analysis		**12**			
	Specification Limits		**Region 7**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Total Acid Number: (mg KOH/g)		**0.015**	0.0010	0.0060	0.0036	0.0041
Aromatics: (vol %)		**25.0**	17.7	24.0	21.26	21.91
Sulfur, Total: (mass %)		**0.30**	0.0010	0.0345	0.013	0.017
Sulfur, Mercaptan: (mass %)		**0.002**	0.0000	0.0003	0.0003	0.0003
Distillation Temperature:						
Initial Boiling Point, (°C)	**Report**		180.8	187.0	183.1	182.5
10% Recovered, (°C)		**205**(186)	189.0	199.0	193.8	192.8
20% Recovered, (°C)	**Report**		192.1	201.0	196.3	195.2
50% Recovered, (°C)	**Report**		199.5	212.0	206.1	204.4
90% Recovered, (°C)	**Report**		217.8	239.6	230.4	227.8
End Point, (°C)		**300**(330)	233.9	261.0	247.2	245.3
Residue, (vol %)		**1.5**	1.0	1.4	1.2	1.2
Loss, (vol %)		**1.5**	0.8	1.5	1.2	1.1
Flash Point: (°C)	**60**		63.0	67.0	64.6	64.8
Density: (kg/L @ 15 °C)	**0.788**	**0.845**	0.8090	0.8243	0.8159	0.8141
Freezing Point: (°C)		**–46**	–80.0	–60.0	–69.1	–66.9
Viscosity: (mm²/s @ –20 °C)		**8.5**	4.000	5.675	4.913	4.725
Heating Value, Heat of combustion: (MJ/kg)	**42.6**		43.000	43.100	43.085	43.089
Cetane Index: (calculated)	**Report**		40.50	42.50	41.2	41.2
Hydrogen Content: (mass %)	**13.4**		13.40	13.79	13.62	13.64
Smoke Point: (mm)	**19.0**		21.0	22.0	21.5	21.5
Thermal Stability:						
Change in pressure drop, mm Hg @ 275 °C		**25**	0.00	2.00	0.45	0.57
Existent Gum: (mg/100 mL)		**7.0**	1.0	2.1	1.47	1.47
Particulate Matter: (mg/L)		**1.0**	0.10	0.40	0.27	0.31
Filtration Time: (minutes)		**15**	3	6	4.55	4.55
MSEP: (rating)	**70**		75	98	89.9	89.5
Fuel System Icing Inhibitor (FSII): (vol %)	**0.10**	**0.15**	0.100	0.150	0.118	0.119

Table 5-5: Region 7 Summary

MIL-DTL-5624 Turbine Fuel, Aviation, Grade JP5 (NATO Code F-44)						
Property	Total Volume		53.15			
	Batch Analysis		21			
	Specification Limits		Region 8			
	Min	Max	Min	Max	Mean	Wt Mean
Total Acid Number: (mg KOH/g)		**0.015**	0.0010	0.0200	0.0050	0.0048
Aromatics: (vol %)		**25.0**	17.1	20.1	18.67	18.72
Sulfur, Total: (mass %)		**0.30**	0.0720	0.1910	0.136	0.130
Sulfur, Mercaptan: (mass %)		**0.002**	0.0006	0.0016	0.0012	0.0012
Distillation Temperature:						
Initial Boiling Point, (°C)	**Report**		174.6	181.7	178.5	178.7
10% Recovered, (°C)		**205(186)**	188.9	197.9	191.0	190.7
20% Recovered, (°C)	**Report**		192.4	201.9	194.8	194.4
50% Recovered, (°C)	**Report**		202.0	214.8	205.4	204.3
90% Recovered, (°C)	**Report**		227.0	249.0	231.4	230.1
End Point, (°C)		**300(330)**	246.4	266.4	253.9	254.5
Residue, (vol %)		**1.5**	1.0	1.4	1.1	1.0
Loss, (vol %)		**1.5**	0.6	1.5	1.0	1.0
Flash Point: (°C)	**60**		61.0	66.0	62.9	62.9
Density: (kg/L @ 15 °C)	**0.788**	**0.845**	0.7964	0.8239	0.8012	0.7996
Freezing Point: (°C)		**–46**	–49.2	–46.5	–48.4	–48.3
Viscosity: (mm^2/s @ –20 °C)		**8.5**	4.107	5.8259	4.533	4.462
Heating Value, Heat of combustion: (MJ/kg)	**42.6**		43.029	43.289	43.234	43.243
Cetane Index: (calculated)	**Report**		40.90	47.40	46.3	46.5
Hydrogen Content: (mass %)	**13.4**		13.50	13.90	13.79	13.83
Smoke Point: (mm)	**19.0**		20.0	26.0	24.0	24.1
Thermal Stability:						
Change in pressure drop, mm Hg @ 275 °C		**25**	0.00	2.00	0.39	0.28
Existent Gum: (mg/100 mL)		**7.0**	0.6	2.6	1.09	1.00
Particulate Matter: (mg/L)		**1.0**	0.21	0.90	0.60	0.60
Filtration Time: (minutes)		**15**	3	7	4.43	3.78
MSEP: (rating)	**70**		76	97	90.4	89.8
Fuel System Icing Inhibitor (FSII): (vol %)	**0.10**	**0.15**	0.104	0.126	0.116	0.116

Table 5-6: Region 8 Summary

5. JP5—Assessment Summary

Overview:

In 2012, 173 reported analyses, representing 418.50 million U.S. gallons of JP5, were processed by Regions 3, 5, 7, and 8. This represents a decrease from the 238 reported JP5 analyses and 529.11 million U.S. gallons of JP5 queried from the PQIS in 2011.

Significant Trending:

Total Acid Number. The weighted mean increased 0.0018 mg KOH/g from 2010 to 2012.

Sulfur, Total. The weighted mean increased 0.020 mass % from 2011 to 2012.

Distillation, 10% Recovered. The weighted mean decreased 5.1 °C from 2011 to 2012 after having increased 3.9 °C from 2008 to 2011.

Hydrogen Content. The weighted mean increased 0.26 mass % from 2009 to 2012.

JP5 Observations:

All batches met specification requirements in 2012.

For **Total Acid Number**, a waiver was granted for one Region 8 measurement greater than the maximum specification limit of 0.015 mg KOH/g. This measurement met the specification limit set by the waiver. This measurement is included in the data tables and figures.

For **Sulfur, Total**, the clause for procurement states a maximum of 0.20 mass % for JP5, but the specification limit for sulfur, total, is a maximum of 0.30 mass %.

For **MSEP**, all JP5 batches met specification requirements. The impact of additives provides for a wide variation (see Table 5-7). Batches were not separated by type of additives or group of additives for this reporting.

Product	Additives[1]	MSEP Rating, min
JP-4 and JP-5	Antioxidant (AO), Metal Deactivator (MDA)	90
JP-4 and JP-5	AO, MDA, and FSII	85
JP-4 and JP-5	AO, MDA, and Corrosion Inhibitor/Lubricity Improver (CI/LI)	80
JP-4 and JP-5	AO, MDA, CI/LI, and FSII	70

Table 5-7: JP-4 and JP-5 Additives and Associated MSEP Ratings

Note 1: Samples submitted for specification conformance testing shall contain the same additives present in the refinery batch. Regardless of which minimum the refiner elects to meet, the refiner shall report the MSEP rating on a laboratory hand blend of the fuel with all additives required by the specification.

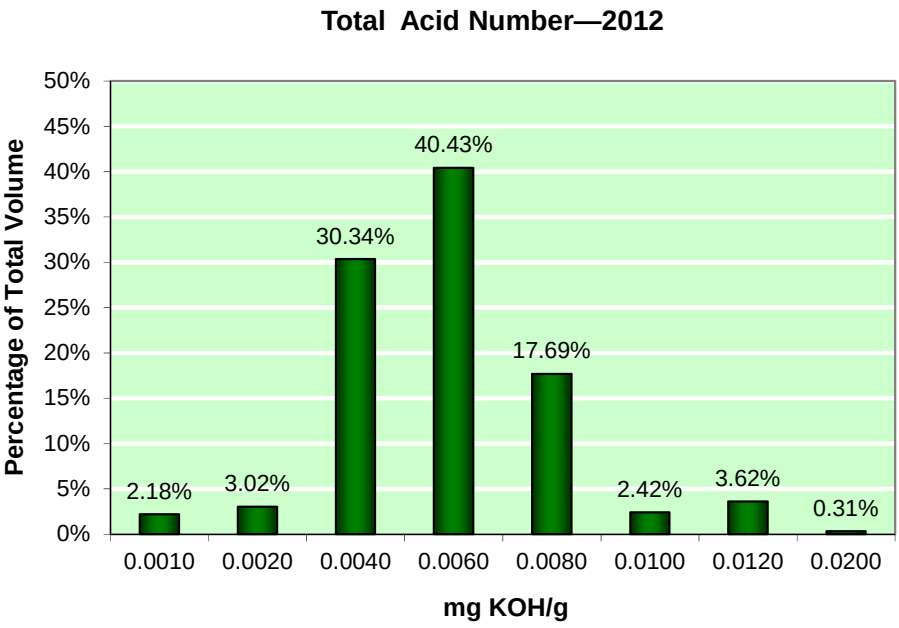


Figure 5-1: Total Acid Number (mg KOH/g), maximum 0.015

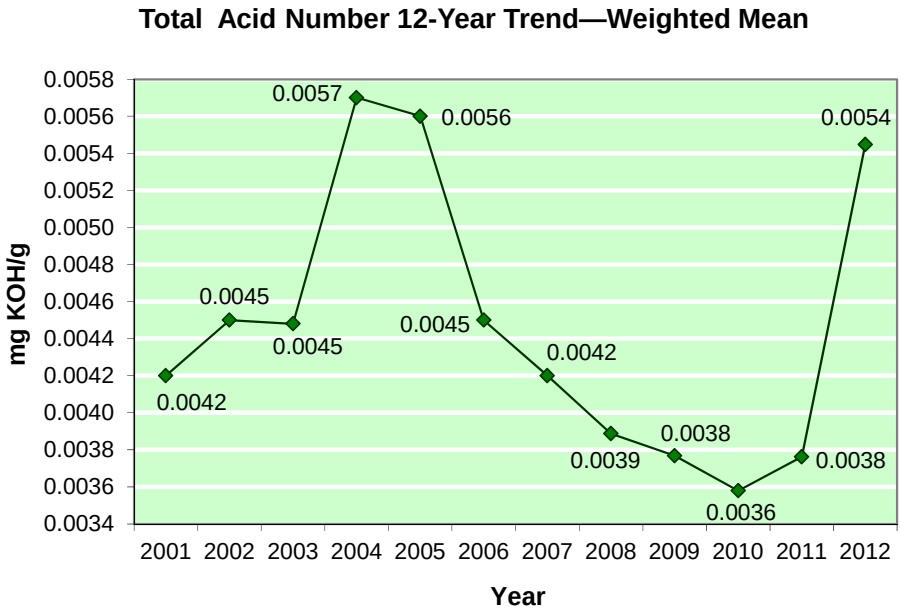


Figure 5-2: Total Acid Number (mg KOH/g), 12-Year Trend, maximum 0.015

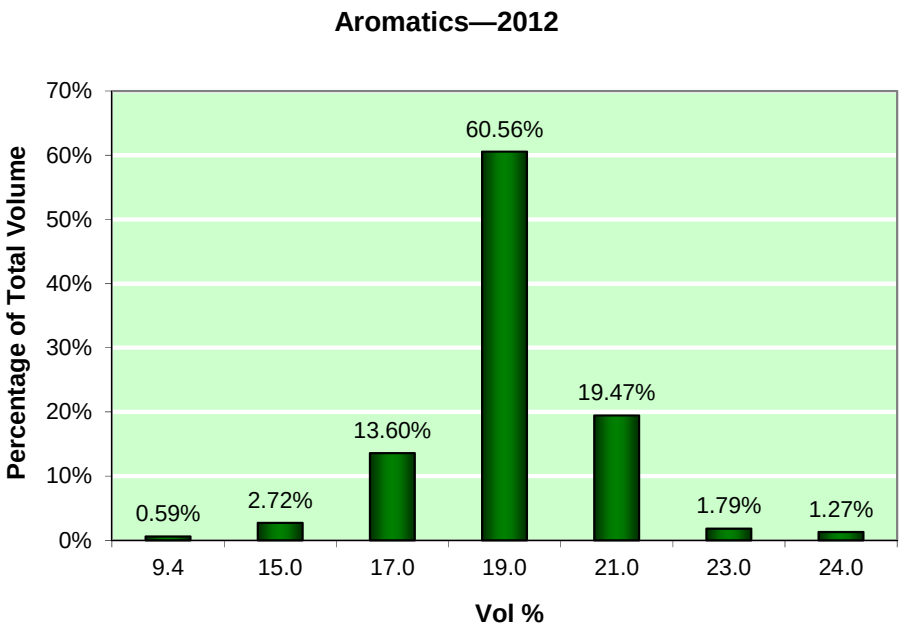


Figure 5-3: Aromatics (vol %), maximum 25.0

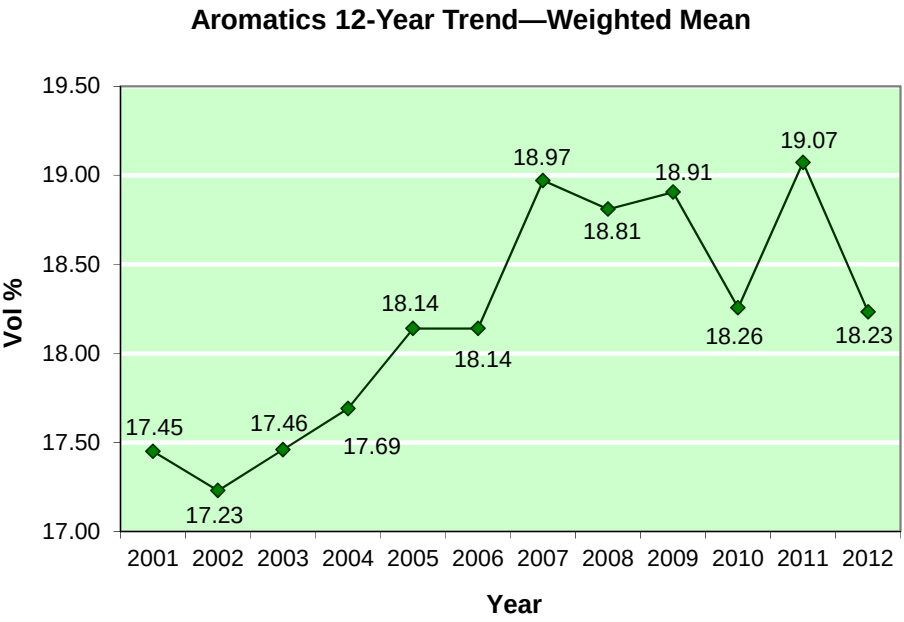


Figure 5-4: Aromatics (vol %), 12-Year Trend, maximum 25.0

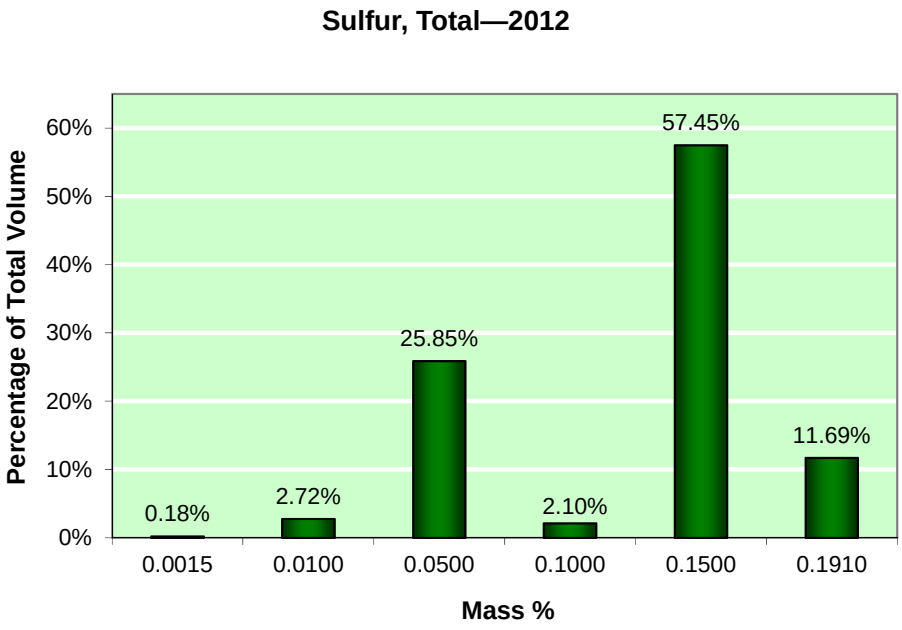


Figure 5-5: Sulfur, Total (mass %), maximum 0.30

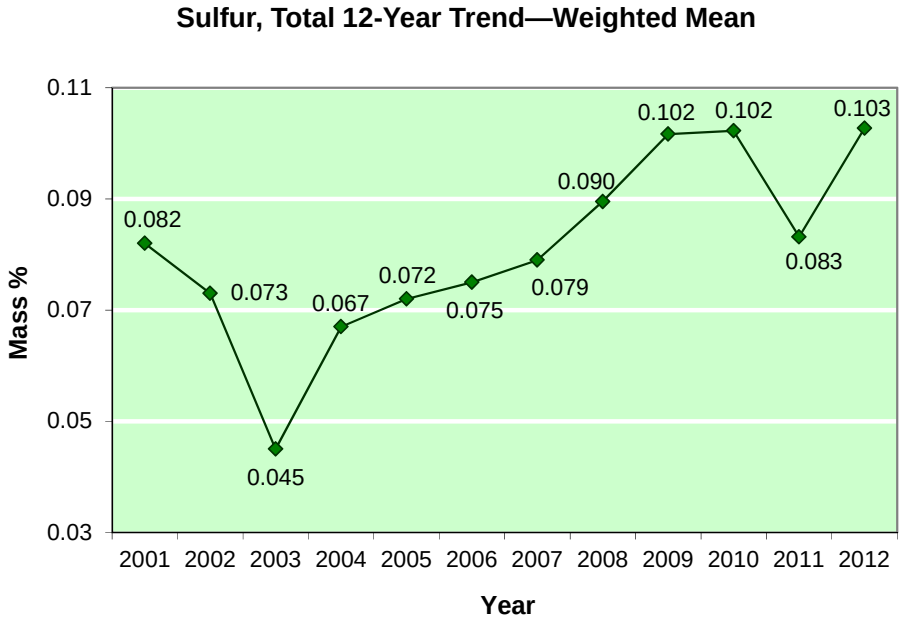


Figure 5-6: Sulfur, Total (mass %), 12-Year Trend, maximum 0.30

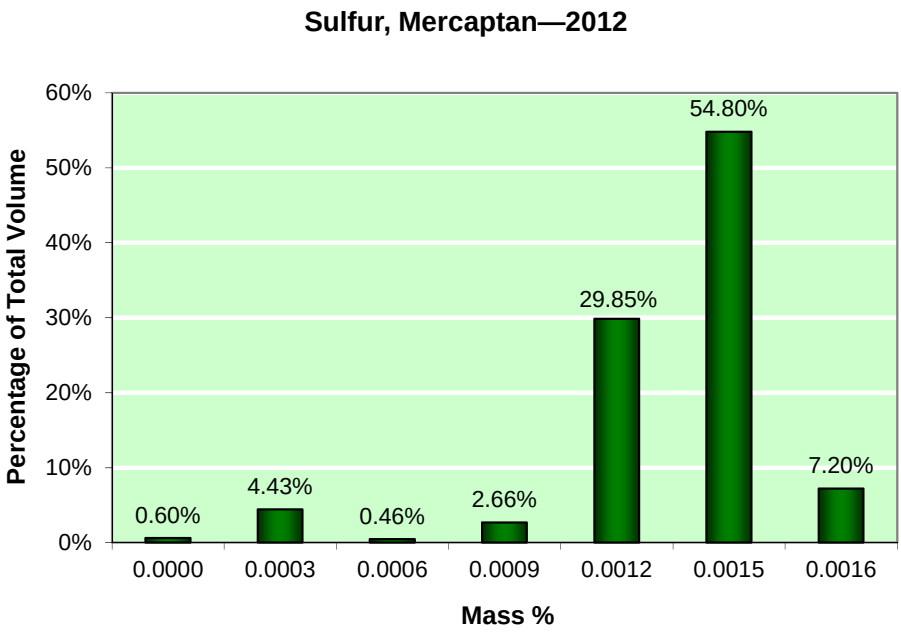


Figure 5-7: Sulfur, Mercaptan (mass %), maximum 0.002

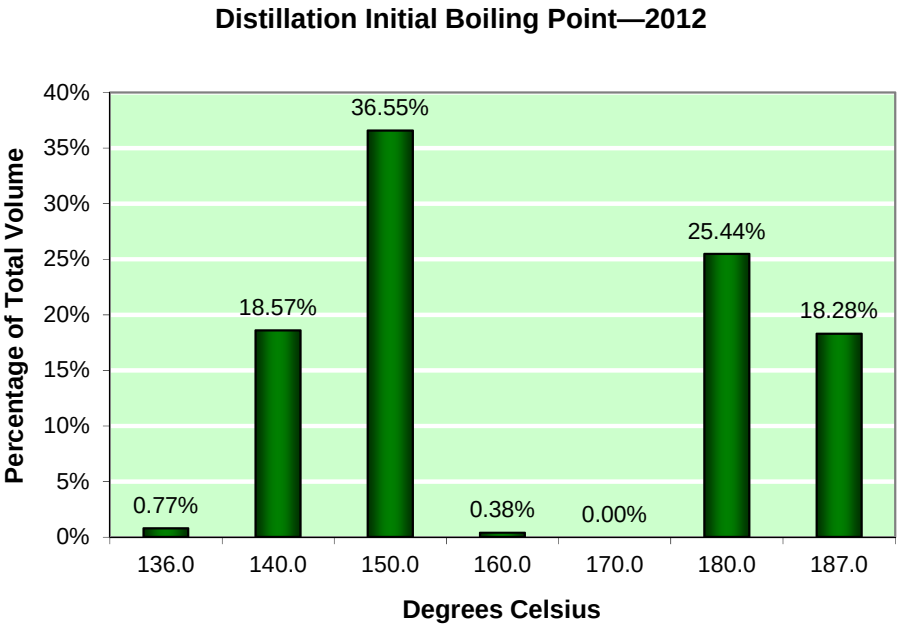


Figure 5-8: Distillation Initial Boiling Point (°C), Report

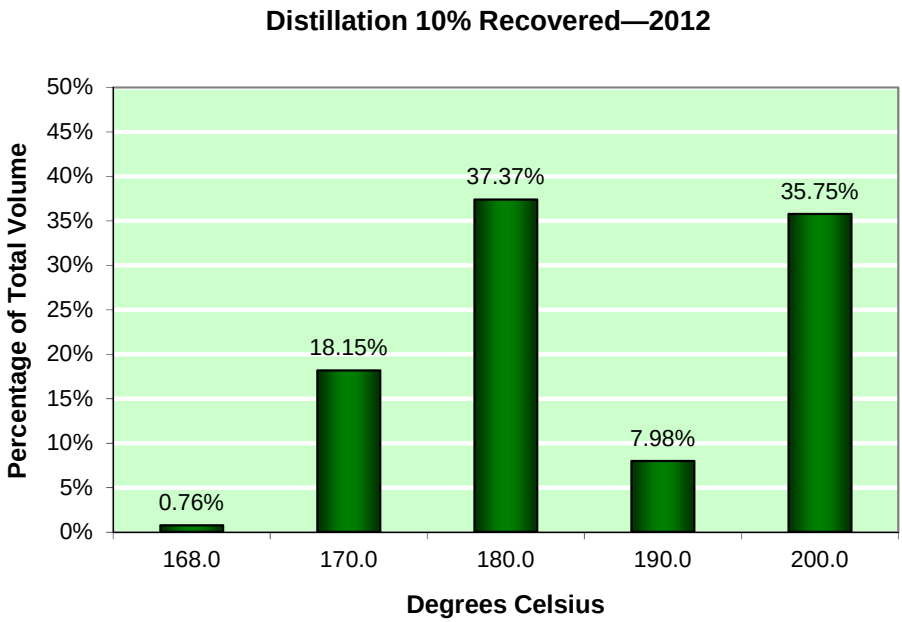


Figure 5-9: Distillation 10% Recovered (°C), maximum 205[(186)] (method D2887 limits in parentheses, °C)

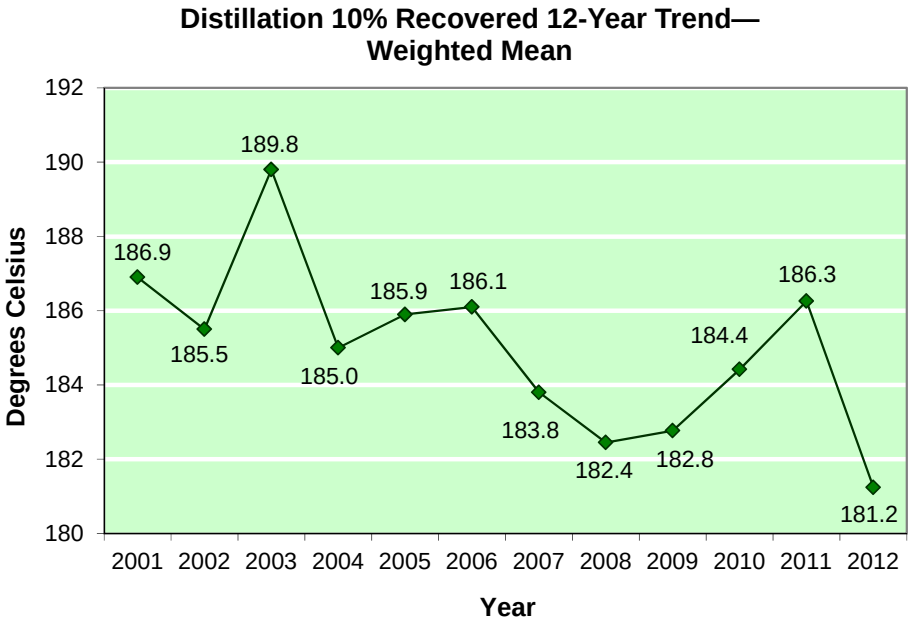


Figure 5-10: Distillation 10% Recovered (°C), 12-Year Trend, maximum 205[(186)] (method D2887 limits in parentheses, °C)

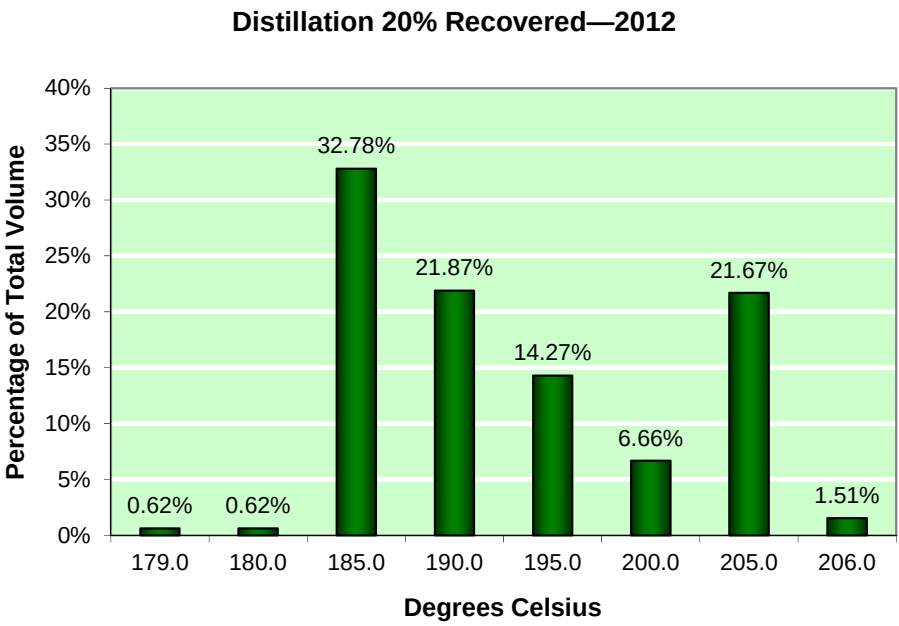


Figure 5-11: Distillation 20% Recovered (°C), Report

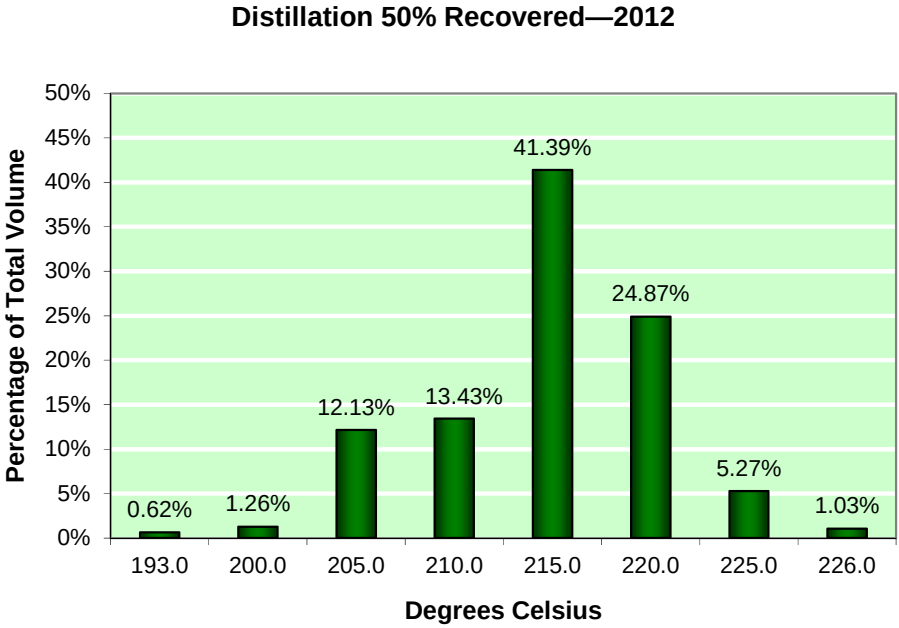


Figure 5-12: Distillation 50% Recovered (°C), Report

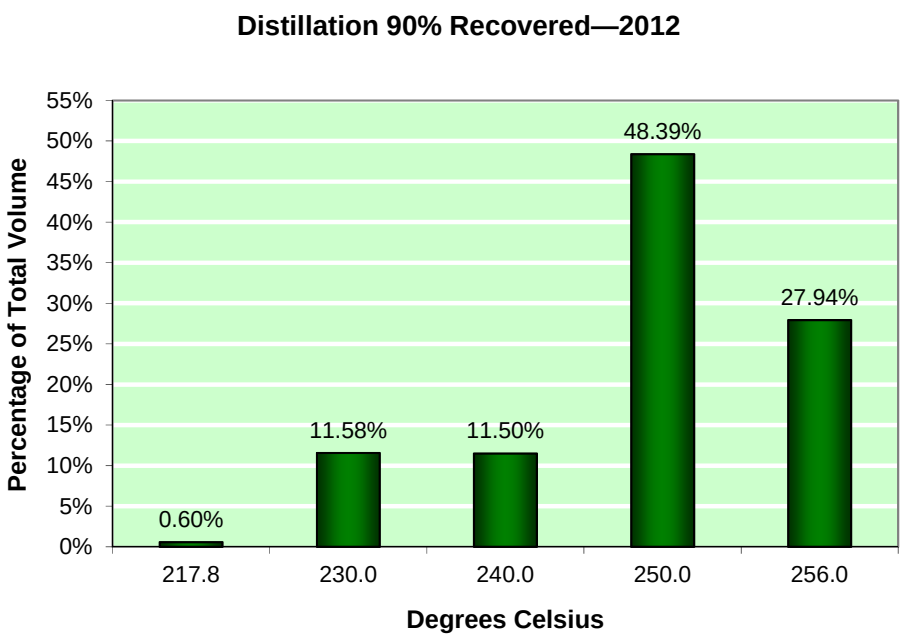


Figure 5-13: Distillation 90% Recovered (°C), Report

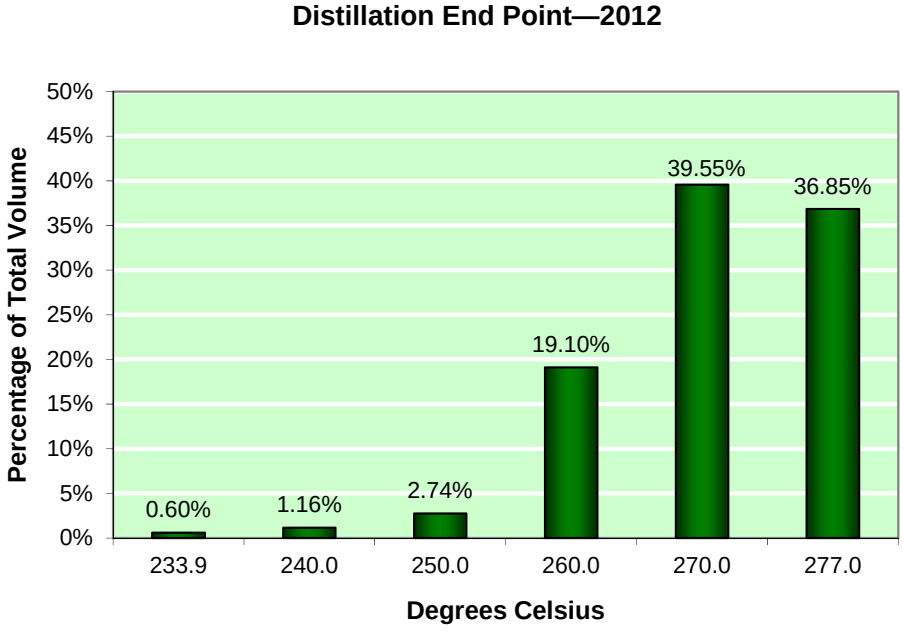


Figure 5-14: Distillation End Point (°C), maximum 300[330] (method D2887 limits in parentheses, °C)

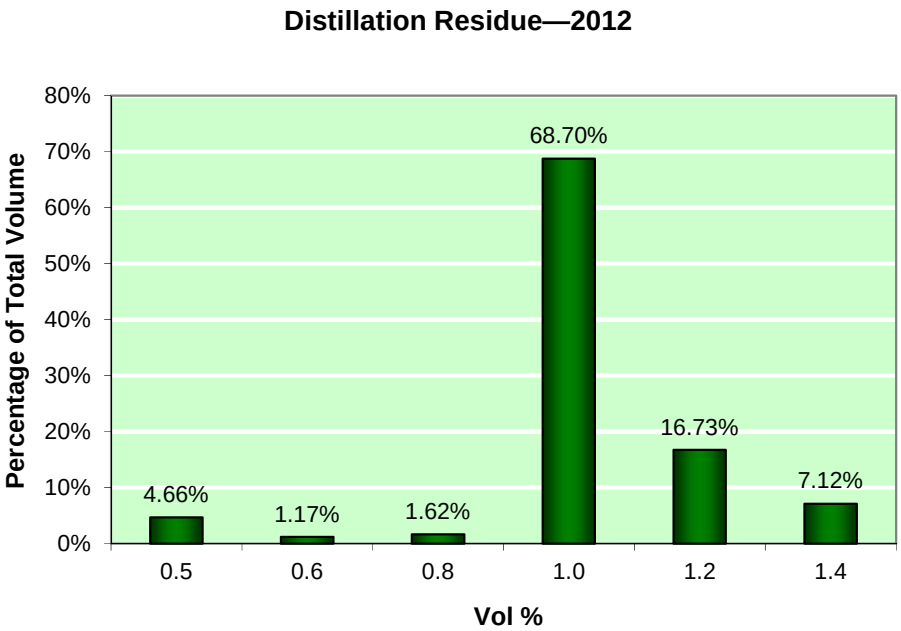


Figure 5-15: Distillation Residue (vol %), maximum 1.5

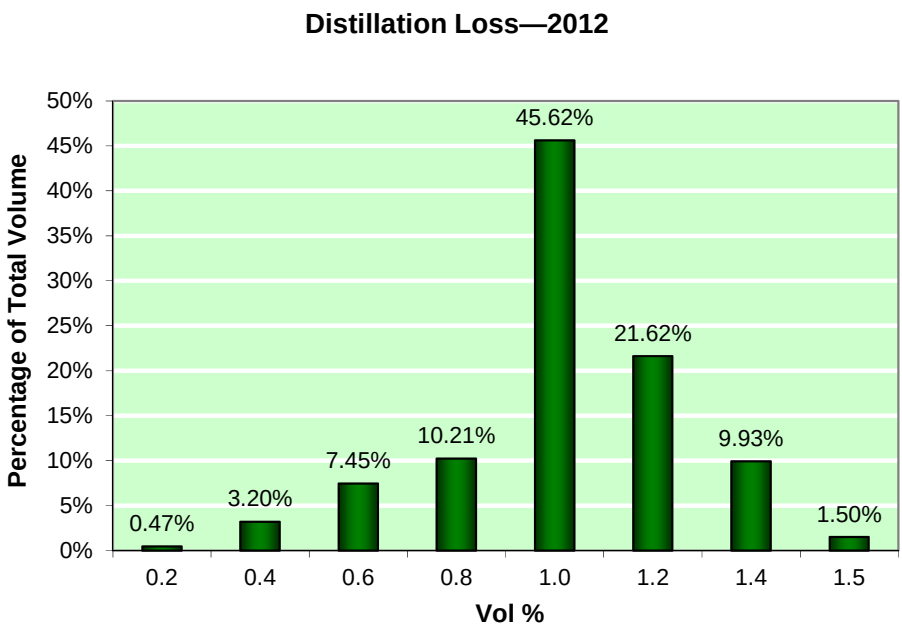


Figure 5-16: Distillation Loss (vol %), maximum 1.5

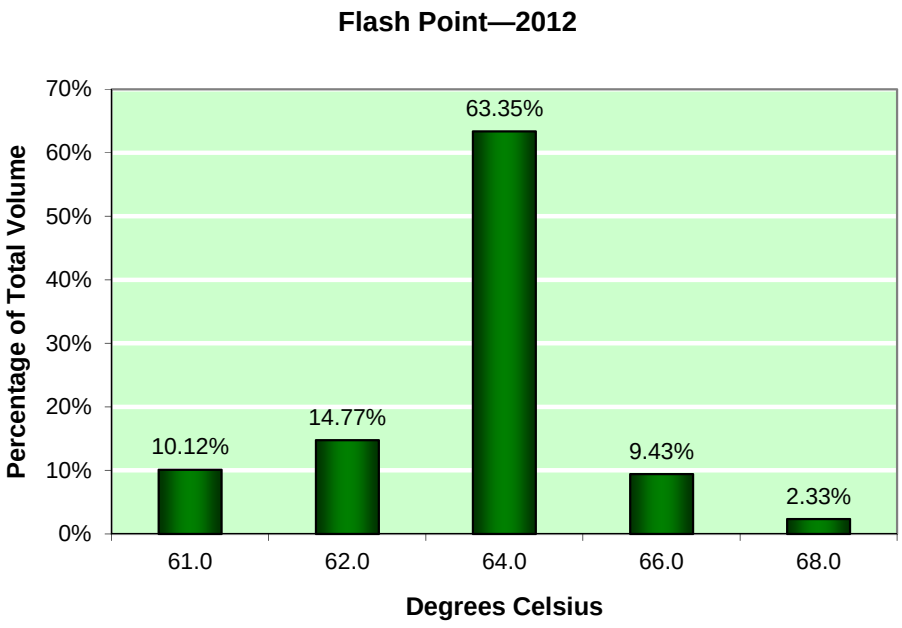


Figure 5-17: Flash Point (°C), minimum 60

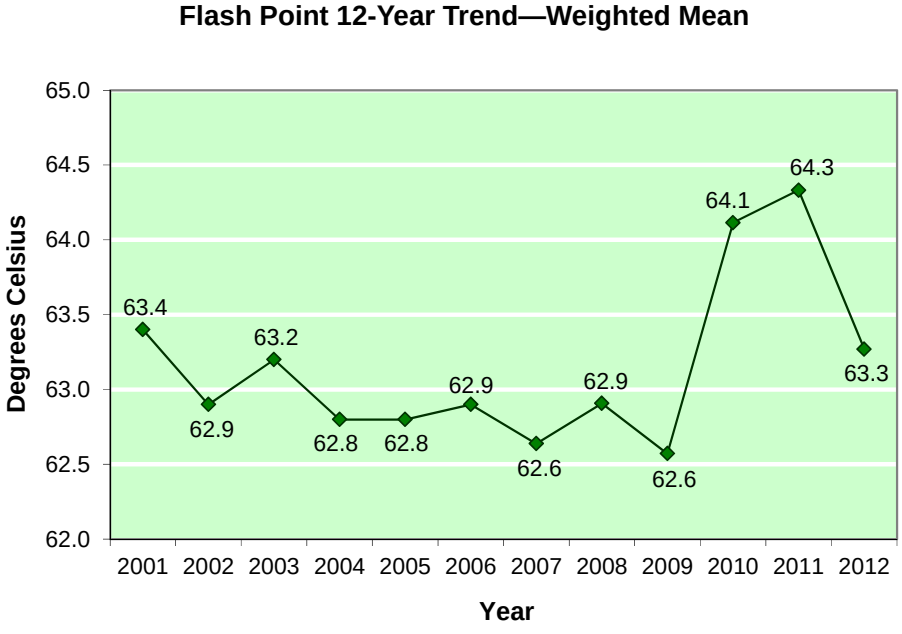


Figure 5-18: Flash Point (°C), 12-Year Trend, minimum 60

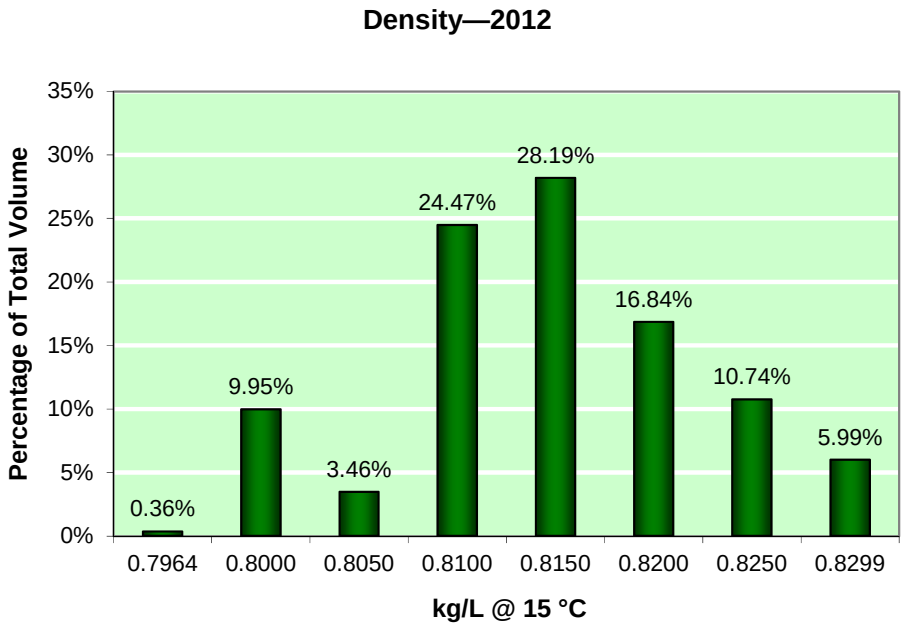


Figure 5-19: Density (kg/L @ 15 °C), minimum 0.788, maximum 0.845

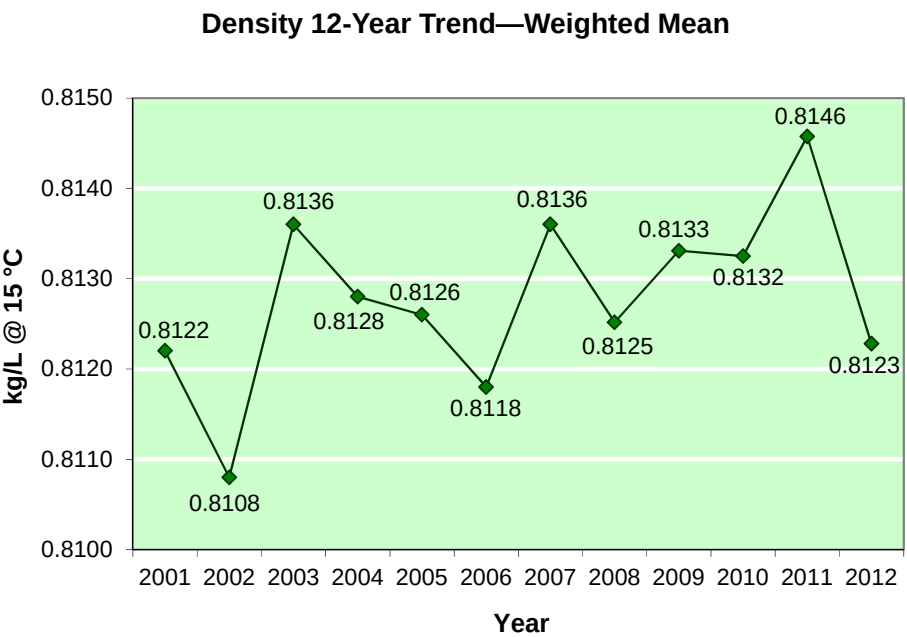


Figure 5-20: Density (kg/L @ 15 °C), 12-Year Trend, minimum 0.788, maximum 0.845

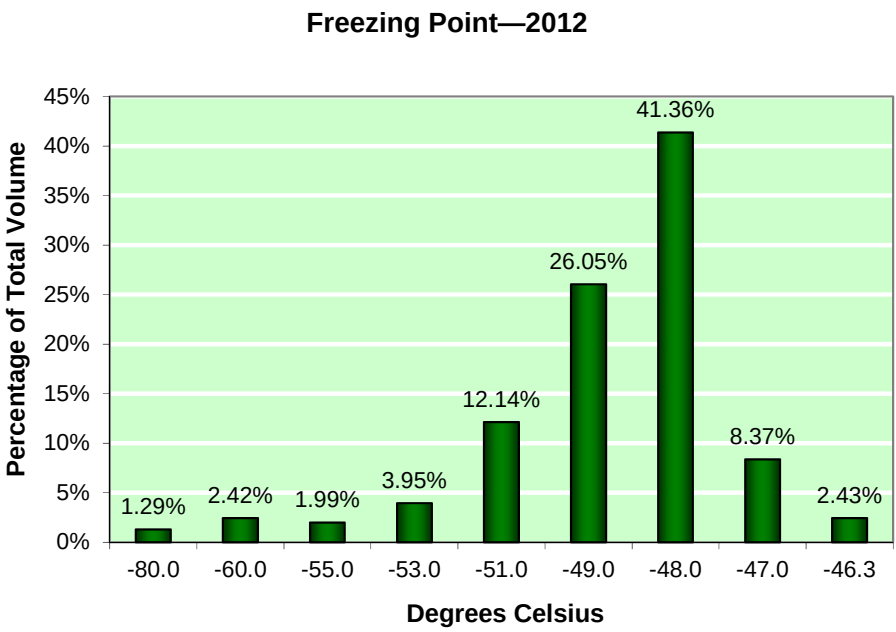


Figure 5-21: Freezing Point (°C), maximum –46

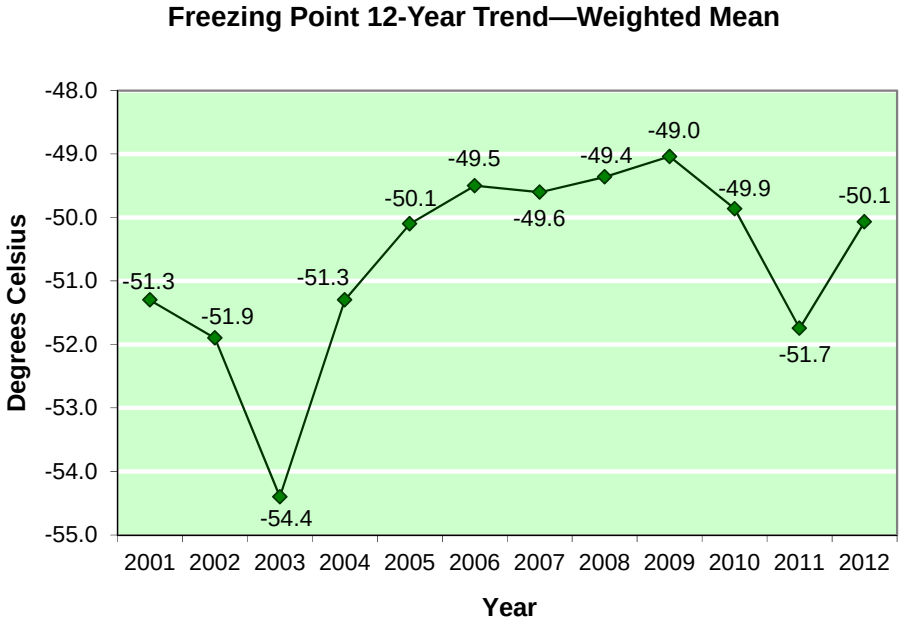


Figure 5-22: Freezing Point (°C), 12-Year Trend, maximum –46

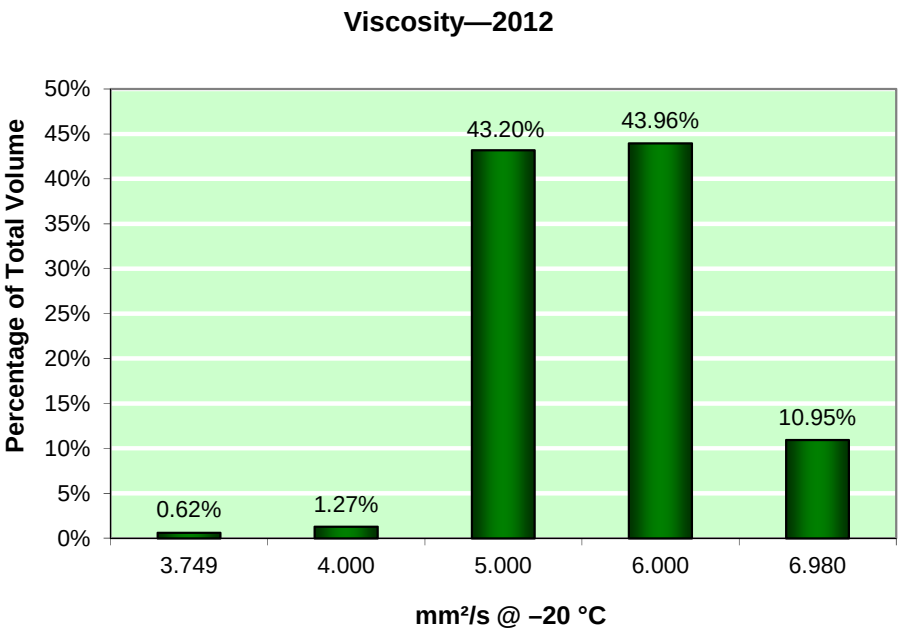


Figure 5-23: Viscosity (mm^2/s @ –20 °C), maximum 8.5

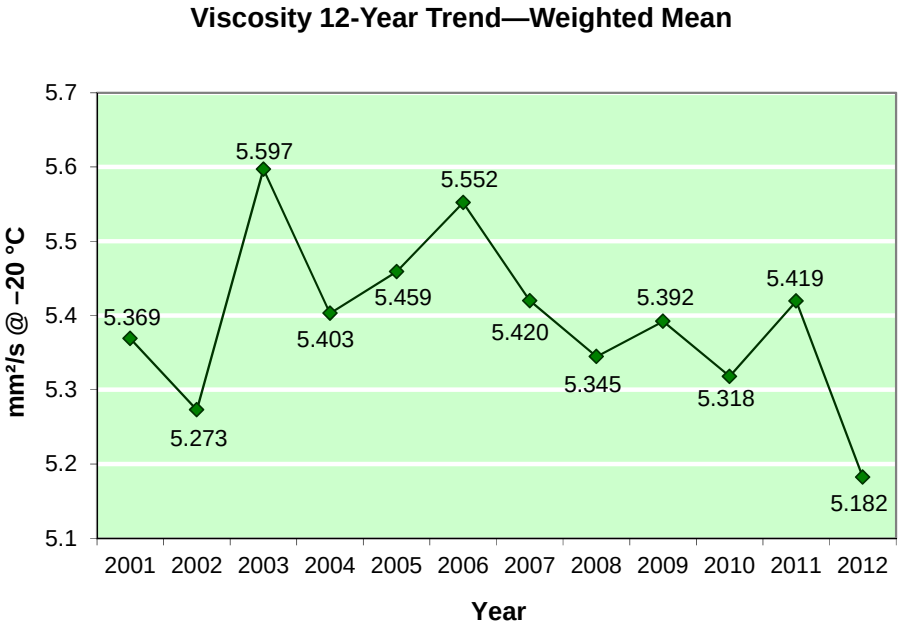


Figure 5-24: Viscosity (mm^2/s @ –20 °C), 12-Year Trend, maximum 8.5

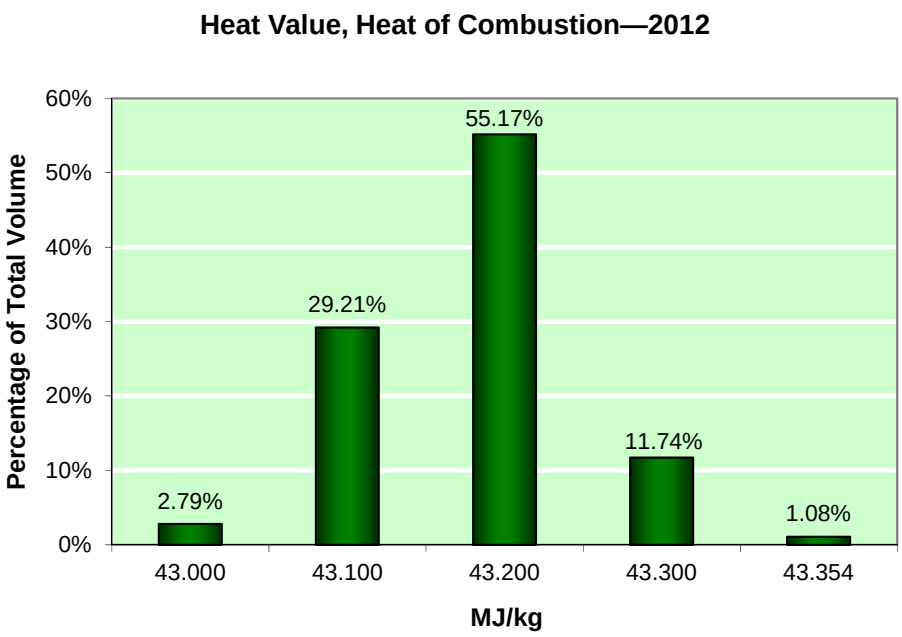


Figure 5-25: Heat Value, Heat of Combustion (MJ/kg), minimum 42.6

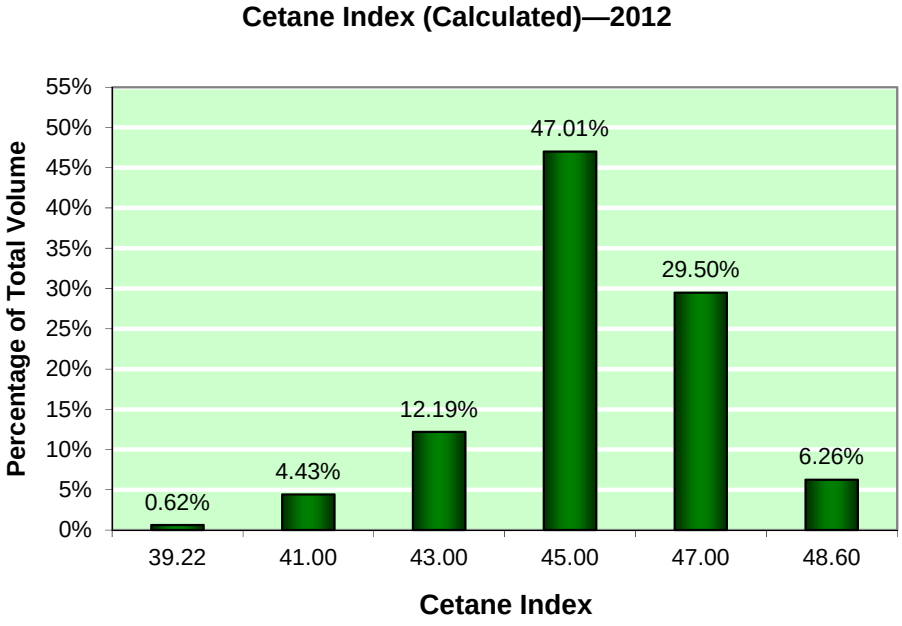


Figure 5-26: Cetane Index (Calculated), Report

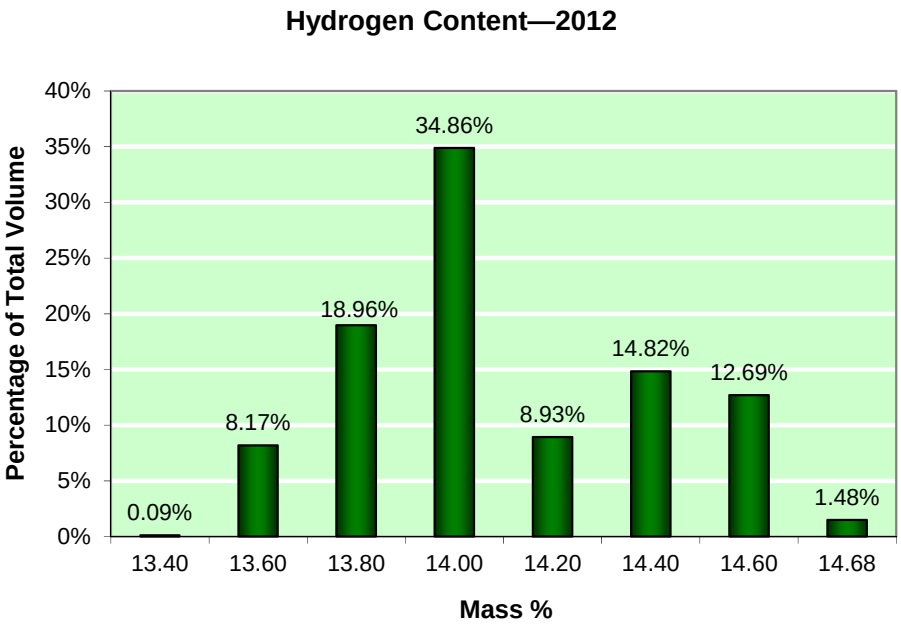


Figure 5-27: Hydrogen Content (mass %), minimum 13.4

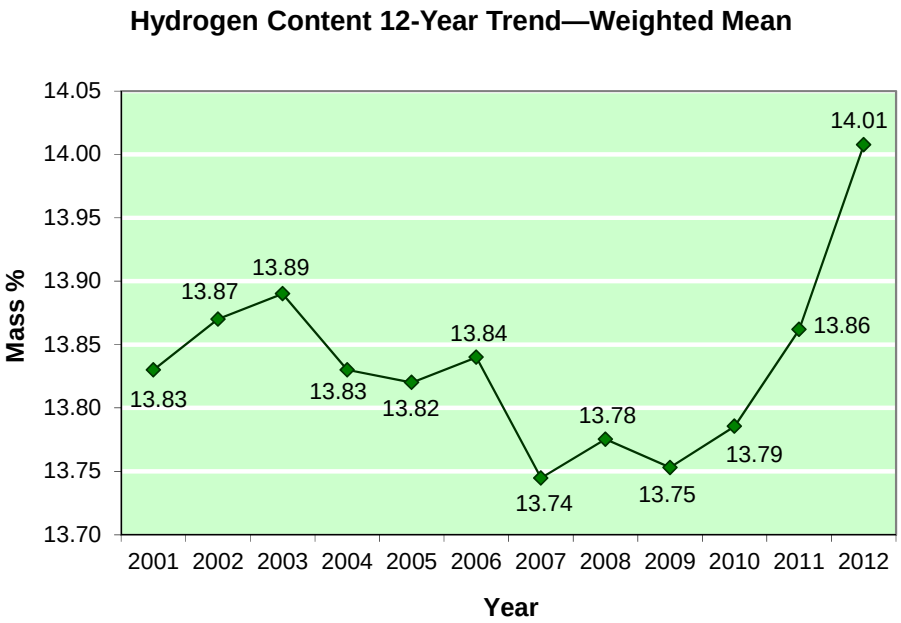


Figure 5-28: Hydrogen Content (mass %), 12-Year Trend, minimum 13.4

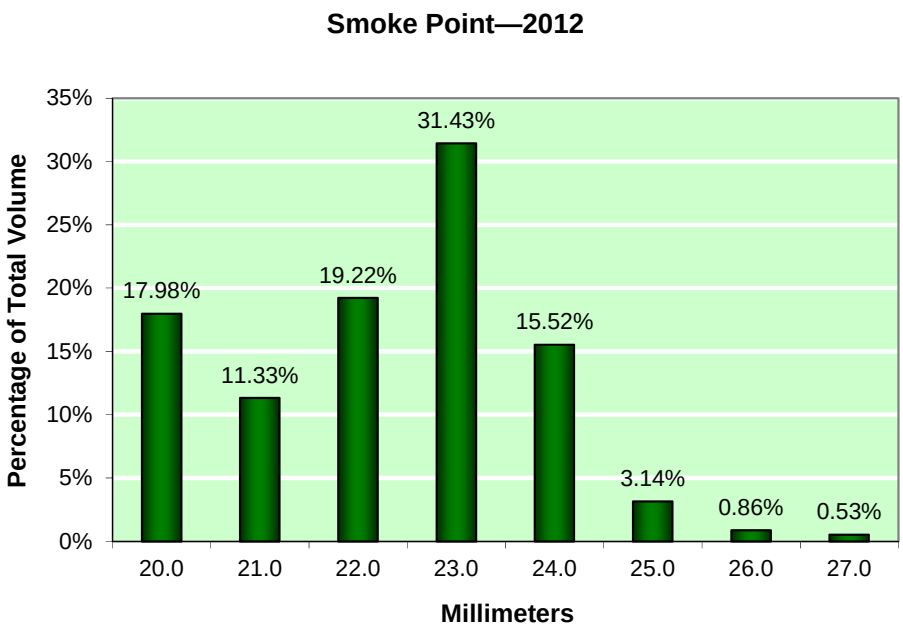


Figure 5-29: Smoke Point (mm), minimum 19.0

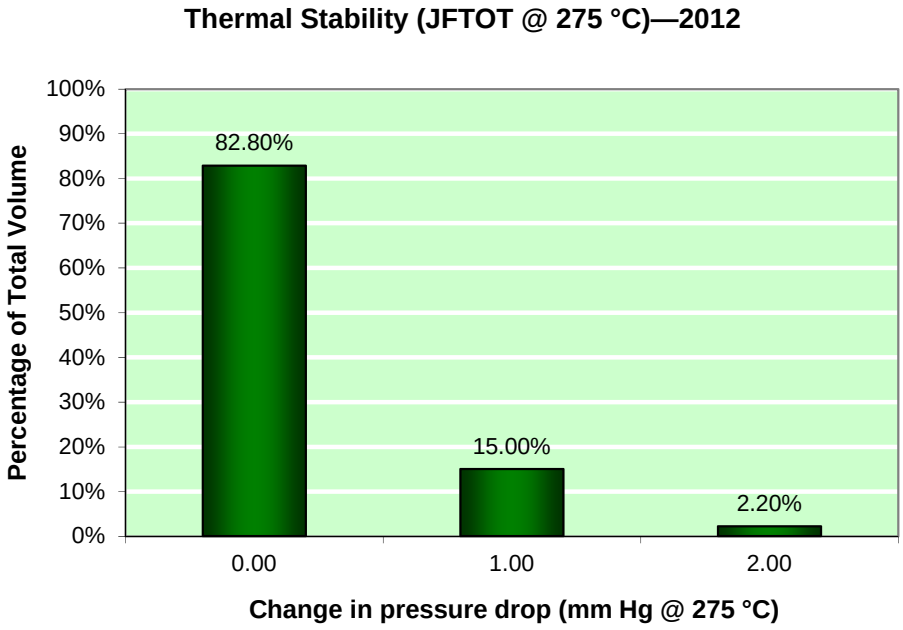


Figure 5-30: Thermal Stability, Change in Pressure Drop (mm Hg @ 275 °C), maximum 25

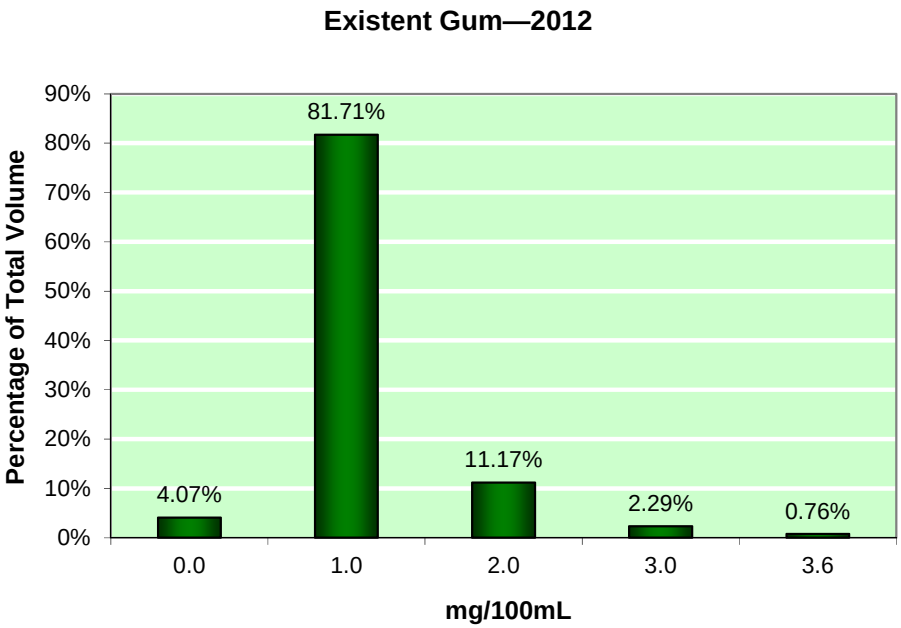


Figure 5-31: Existent Gum (mg/100 mL), maximum 7.0

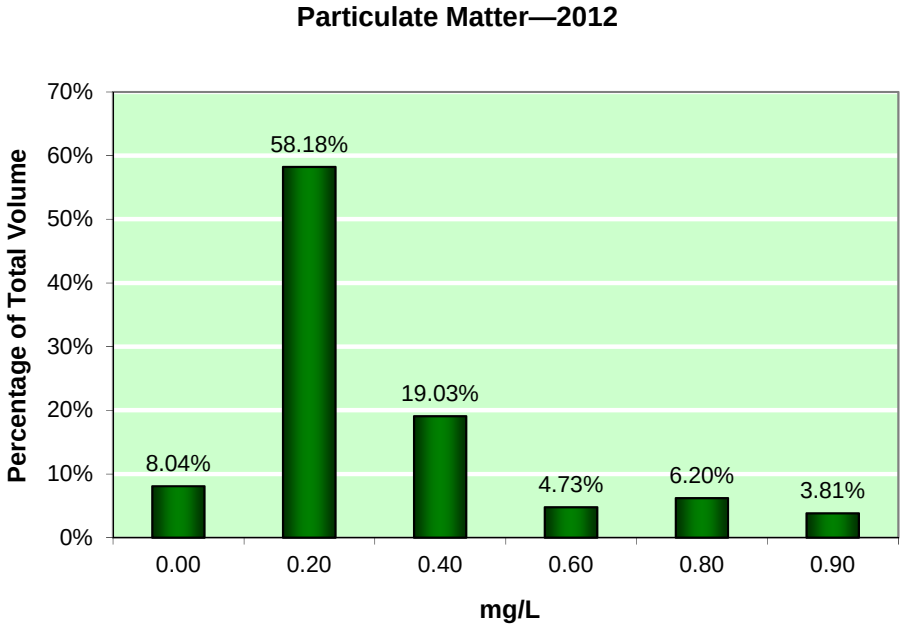


Figure 5-32: Particulate Matter (mg/L), maximum 1.0

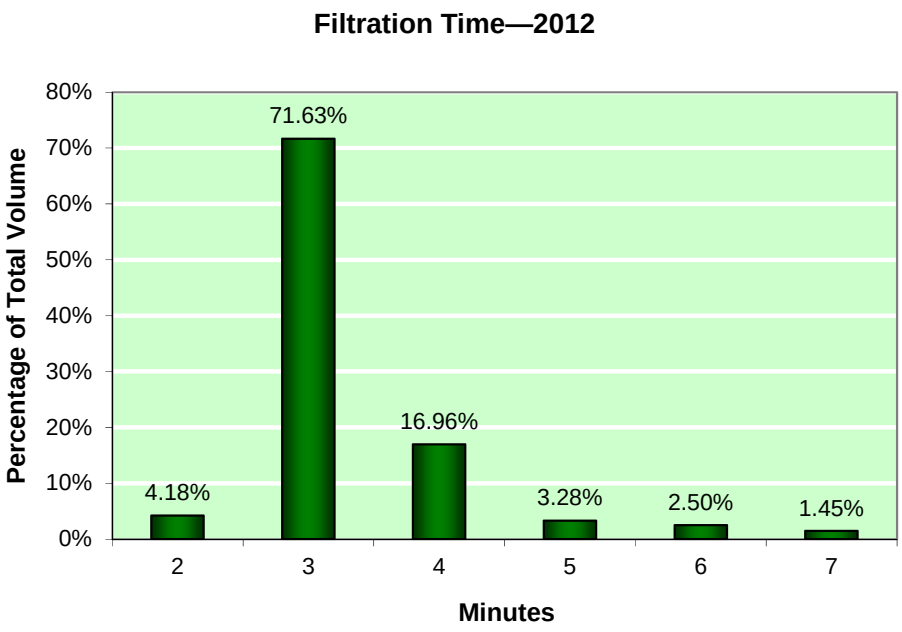


Figure 5-33: Filtration Time (minutes), maximum 15

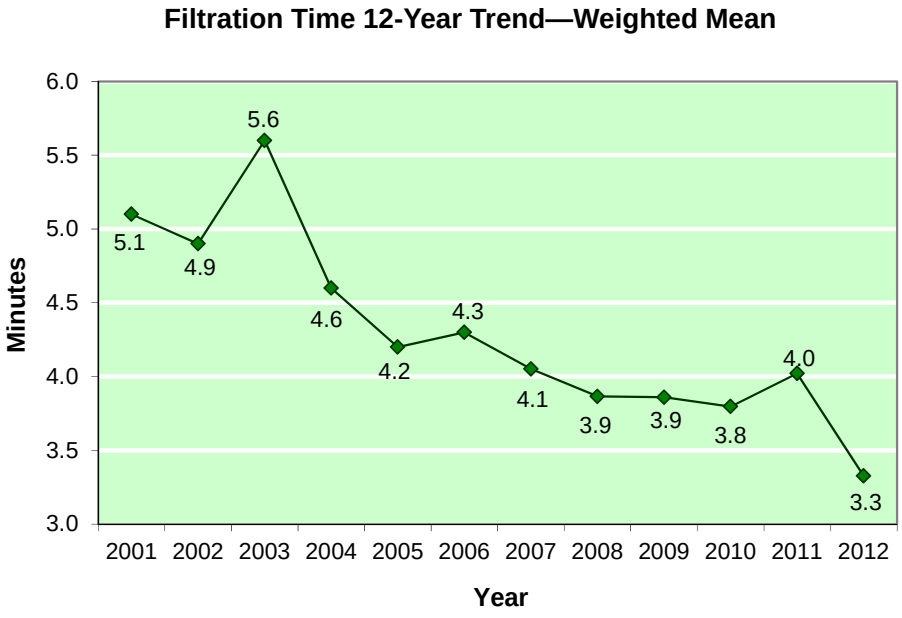


Figure 5-34: Filtration Time (minutes), 12-Year Trend, maximum 15

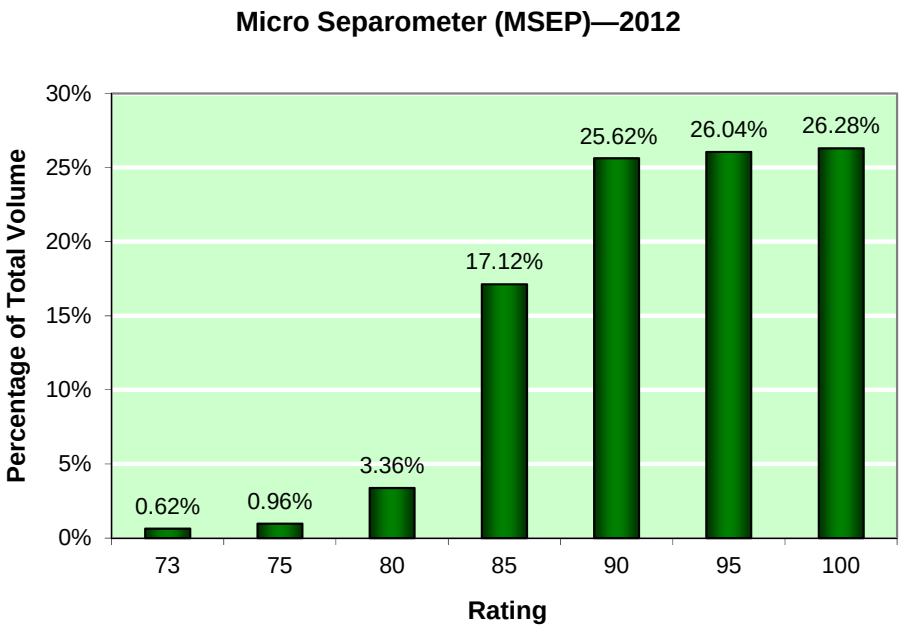


Figure 5-35: Micro Separometer (rating), minimum 70

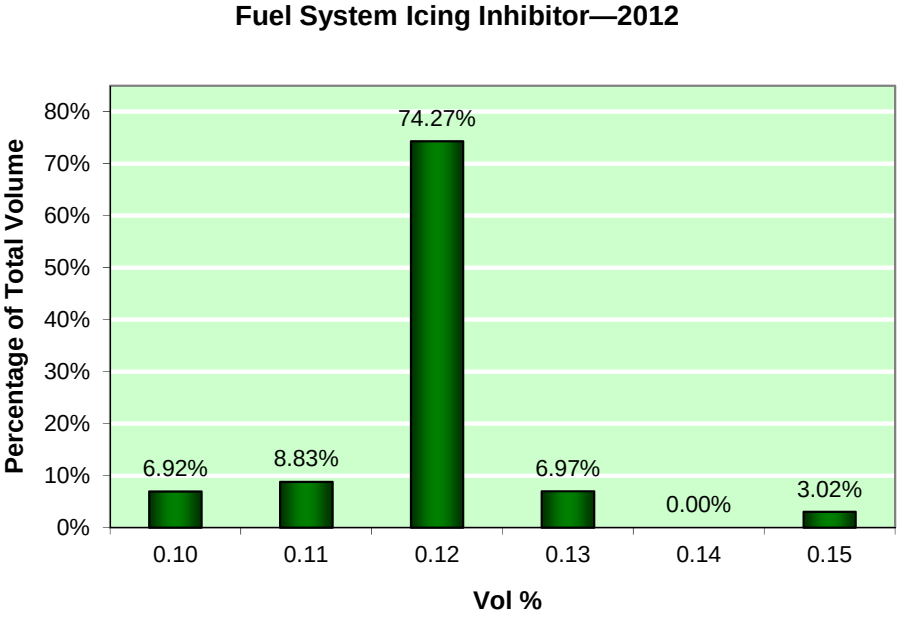


Figure 5-36: Fuel System Icing Inhibitor (vol %), minimum 0.10, maximum 0.15


JETA-1
LIQUIP

Jet A-1 Turbine Fuel, Aviation, Defence Standard 91-91			
Property	**2012 Source Inputs**		
	Region	**Volume**	**Analysis**
Total Acid Number: (mg KOH/g)	All	407.38	153
Aromatics: (vol %)	All	407.38	153
Sulfur, Total: (mass %)	All	384.78	152
Sulfur Mercaptan: (mass %)	All	404.66	153
Distillation:			
Initial Boiling Point (IBP), (°C)	All	434.41	176
10% Recovered, (°C)	All	434.41	176
50% Recovered, (°C)	All	434.41	176
90% Recovered, (°C)	All	434.41	176
Final Boiling Point (FBP), (°C)	All	434.41	176
Residue, (vol %)	All	400.79	158
Loss, (vol %)	All	400.79	158
Flash Point: (°C)	All	434.41	176
Density: (kg/m³ @ 15 °C)	All	434.41	176
Freezing Point: (°C)	All	418.69	174
Viscosity: (mm²/s @ –20 °C)	All	407.34	153
Net Heat of Combustion: (MJ/kg)	All	407.38	153
Smoke Point: (mm)	All	399.61	151
Naphthalene: (vol %)	All	107.33	109
Thermal Stability:			
Change in pressure drop, mm Hg @ 275 °C	All	NR	NR
Change in pressure drop, mm Hg @ 260 °C	All	390.70	151
Existent Gum: (mg/100 mL)	All	409.74	169
Particulate Contamination: (mg/L)	All	432.16	173
Water Separation Index: (rating)	All	419.37	173

Table 6-1: Data Summary, Jet A–1 Turbine Fuel, Aviation, Defence Standard 91–91, 2012 Source Inputs

Jet A-1 Turbine Fuel, Aviation, Defence Standard 91-91						
Property	**Specification Limits**		**2012 Test Results**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Total Acid Number: (mg KOH/g)		**0.015**	0.0000	0.0120	0.0030	0.0037
Aromatics: (vol %)		**25.0**	14.20	24.70	17.91	17.63
Sulfur, Total: (mass %)		**0.3**	0.0000	0.2900	0.093	0.099
Sulfur Mercaptan:[1] (mass %)		**0.003**	0.0000	0.0029	0.0012	0.0012
Distillation:						
Initial Boiling Point (IBP), (°C)	**Report**		141.9	162.0	149.9	148.6
10% Recovered, (°C)		**205.0**	152.6	177.7	168.3	165.9
50% Recovered, (°C)	**Report**		175.3	203.6	195.0	192.6
90% Recovered, (°C)	**Report**		205.5	247.0	234.0	235.8
Final Boiling Point (FBP), (°C)		**300.0**	221.0	280.0	257.1	259.2
Residue, (vol %)		**1.5**	0.6	1.5	1.2	1.1
Loss, (vol %)		**1.5**	0.0	1.5	0.5	0.8
Flash Point: (°C)	**38.0**		38.0	49.0	41.5	40.6
Density: (kg/m³ @ 15 °C)	**775.0**	**840.0**	784.7	811.0	798.6	795.0
Freezing Point: (°C)		**–47**	–68.50	–48.00	–53.04	–52.72
Viscosity: (mm²/s @ –20 °C)		**8.0**	2.773	4.394	3.694	3.589
Net Heat of Combustion: (MJ/kg)	**42.80**		43.060	44.800	43.256	43.285
Smoke Point:[2] (mm)	**25.0**		20.00	27.00	23.69	24.72
Naphthalene: (vol %)		**3**	0.15	2.56	1.12	1.34
Thermal Stability:						
Change in pressure drop, mm Hg @ 275 °C		**25**	NR	NR	NR	NR
Change in pressure drop, mm Hg @ 260 °C			0.00	25.00	1.48	0.75
Existent Gum: (mg/100 mL)		**7.0**	0.40	6.00	1.25	1.38
Particulate Contamination: (mg/L)		**1.0**	0.01	0.90	0.25	0.34
Water Separation Index:[3] (rating)	**70**		70	105	95.9	97.7

Table 6-2: Data Summary, Jet A–1 Turbine Fuel, Aviation, Defence Standard 91–91, 2012 Test Results

Note 1: Either the sulfur mercaptan limit or a negative doctor test result is acceptable to meet the specification requirement.
Note 2: When the smoke point result is below 25 mm, the product is acceptable so long as the naphthalene content is below 3.0 percent and the smoke point is above the minimum of 19 mm.
Note 3: The minimum MSEP rating with SDA is 70. The minimum MSEP rating without SDA is 85.

Jet A-1 Turbine Fuel, Aviation, Defence Standard 91-91						
Property	**Total Volume**		192.55			
	Batch Analysis		16			
	Specification Limits		**Region 6**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Total Acid Number: (mg KOH/g)		**0.015**	0.0010	0.0090	0.0034	0.0035
Aromatics: (vol %)		**25.0**	14.29	18.68	16.68	16.79
Sulfur, Total: (mass %)		**0.3**	0.0000	0.1634	0.070	0.073
Sulfur Mercaptan: (mass %)		**0.003**	0.00006	0.0014	0.0006	0.0006
Distillation:						
Initial Boiling Point (IBP), (°C)	**Report**		145.0	151.0	147.6	147.7
10% Recovered, (°C)		**205.0**	160.0	171.0	163.8	163.9
50% Recovered, (°C)	**Report**		182.0	200.0	189.9	190.3
90% Recovered, (°C)	**Report**		216.0	247.0	236.1	237.0
Final Boiling Point (FBP), (°C)		**300.0**	232.0	280.0	259.5	261.0
Residue, (vol %)		**1.5**	1.0	1.5	1.0	1.0
Loss, (vol %)		**1.5**	1.0	1.5	1.1	1.0
Flash Point: (°C)	**38.0**		38.0	42.0	39.8	39.8
Density: (kg/m³ @ 15 °C)	**775.0**	**840.0**	784.7	796.9	790.5	790.8
Freezing Point: (°C)		**–47**	–61.00	–49.50	–53.11	–52.70
Viscosity: (mm²/s @ –20 °C)		**8.0**	3.090	4.170	3.482	3.503
Net Heat of Combustion: (MJ/kg)	**42.80**		43.260	43.430	43.344	43.340
Smoke Point: (mm)	**25.0**		25.00	27.00	25.87	25.79
Naphthalene: (vol %)		**3**	NR	NR	NR	NR
Thermal Stability:						
Change in pressure drop, mm Hg @ 275 °C		**25**	NR	NR	NR	NR
Change in pressure drop, mm Hg @ 260 °C			0.00	1.00	0.21	0.16
Existent Gum: (mg/100 mL)		**7.0**	0.40	3.00	1.11	1.07
Particulate Contamination: (mg/L)		**1.0**	0.10	0.76	0.48	0.47
Water Separation Index: (rating)	**70**		96	100	98.9	99.0

Table 6-3: Region 6 Summary

Jet A-1 Turbine Fuel, Aviation, Defence Standard 91-91						
Property	**Total Volume**		190.96			
	Batch Analysis		156			
	Specification Limits		**Region 7**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Total Acid Number: (mg KOH/g)		**0.015**	0.0000	0.0120	0.0029	0.0036
Aromatics: (vol %)		**25.0**	14.20	24.70	18.03	18.28
Sulfur, Total: (mass %)		**0.3**	0.0001	0.2900	0.094	0.119
Sulfur Mercaptan: (mass %)		**0.003**	0.0000	0.0029	0.0013	0.0015
Distillation:						
Initial Boiling Point (IBP), (°C)	**Report**		141.9	162.0	150.1	149.0
10% Recovered, (°C)		**205.0**	152.6	177.7	168.8	167.7
50% Recovered, (°C)	**Report**		175.3	203.6	195.7	195.8
90% Recovered, (°C)	**Report**		205.5	245.4	233.8	236.2
Final Boiling Point (FBP), (°C)		**300.0**	221.0	273.9	257.0	259.8
Residue, (vol %)		**1.5**	0.6	1.5	1.3	1.2
Loss, (vol %)		**1.5**	0.0	1.4	0.4	0.6
Flash Point: (°C)	**38.0**		38.0	49.0	41.65	41.1
Density: (kg/m³ @ 15 °C)	**775.0**	**840.0**	785.3	811.0	799.5	799.4
Freezing Point: (°C)		**–47**	–68.50	–48.00	–53.02	–52.45
Viscosity: (mm²/s @ –20 °C)		**8.0**	2.773	4.394	3.724	3.703
Net Heat of Combustion: (MJ/kg)	**42.80**		43.060	44.800	43.245	43.224
Smoke Point: (mm)	**25.0**		20.00	26.00	23.39	23.37
Naphthalene: (vol %)		**3**	0.15	2.56	1.12	1.34
Thermal Stability:						
Change in pressure drop, mm Hg @ 275 °C		**25**	NR	NR	NR	NR
Change in pressure drop, mm Hg @ 260 °C			0.00	25.00	1.67	1.59
Existent Gum: (mg/100 mL)		**7.0**	1.00	6.00	1.23	1.35
Particulate Contamination: (mg/L)		**1.0**	0.01	0.90	0.23	0.24
Water Separation Index: (rating)	**70**		70	105	95.5	96.7

Table 6-4: Region 7 Summary

Jet A-1 Turbine Fuel, Aviation, Defence Standard 91-91						
Property	**Total Volume**		63.57			
	Batch Analysis		5			
	Specification Limits		**Region 8**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Total Acid Number: (mg KOH/g)		**0.015**	0.0030	0.0080	0.0044	0.0045
Aromatics: (vol %)		**25.0**	17.30	21.68	18.30	18.35
Sulfur, Total: (mass %)		**0.3**	0.0368	0.2209	0.140	0.138
Sulfur Mercaptan: (mass %)		**0.003**	0.0009	0.0024	0.0020	0.0019
Distillation:						
Initial Boiling Point (IBP), (°C)	**Report**		147.0	154.0	150.2	150.2
10% Recovered, (°C)		**205.0**	159.0	170.0	166.4	166.3
50% Recovered, (°C)	**Report**		182.0	194.0	190.0	189.9
90% Recovered, (°C)	**Report**		228.0	238.0	231.0	231.1
Final Boiling Point (FBP), (°C)		**300.0**	235.0	270.0	252.0	252.2
Residue, (vol %)		**1.5**	0.8	1.4	1.0	1.0
Loss, (vol %)		**1.5**	0.5	1.0	0.7	0.7
Flash Point: (°C)	**38.0**		39.0	44.0	41.8	41.8
Density: (kg/m³ @ 15 °C)	**775.0**	**840.0**	788.4	797.5	794.0	793.9
Freezing Point: (°C)		**–47**	–56.00	–51.00	–53.60	–53.56
Viscosity: (mm²/s @ –20 °C)		**8.0**	3.460	3.610	3.540	3.541
Net Heat of Combustion: (MJ/kg)	**42.80**		43.230	43.340	43.286	43.285
Smoke Point: (mm)	**25.0**		25.00	25.00	25.00	25.00
Naphthalene: (vol %)		**3**	NR	NR	NR	NR
Thermal Stability:						
Change in pressure drop, mm Hg @ 275 °C		**25**	NR	NR	NR	NR
Change in pressure drop, mm Hg @ 260 °C			0.00	1.00	0.20	0.20
Existent Gum: (mg/100 mL)		**7.0**	1.20	3.20	2.28	2.26
Particulate Contamination: (mg/L)		**1.0**	0.20	0.53	0.29	0.30
Water Separation Index: (rating)	**70**		96	99	97.6	97.6

Table 6-5: Region 8 Summary

Overview:

JA1 was first featured in the 2004 report because of increasing annual procurements. In 2012, 177 reported analyses, representing 447.07 million U.S. gallons of JA1, were processed by Regions 6, 7, and 8. This was a decrease from the 248 reported JA1 analyses and the 467.90 million U.S. gallons of JA1 queried from the PQIS in 2011.

Trending:

Aromatics. The weighted mean decreased 0.84 vol % from 2010 to 2012.

Sulfur, Total. The weighted mean decreased 0.059 mass % from 2011 to 2012.

Distillation, 10% Recovered. The weighted mean decreased 2.3 °C from 2010 to 2012.

Distillation Final Boiling Point. The weighted mean decreased 5.2 °C from 2010 to 2012.

Distillation Loss. The weighted mean increased 0.3 vol % from 2010 to 2012.

Density. The weighted mean decreased 2.0 kg/m^3 @ 15 °C from 2010 to 2012.

Viscosity. The weighted mean decreased 0.249 mm^2/s @ –20 °C from 2010 to 2012.

Water Separation Index. The weighted mean increased 1.7 from 2010 to 2012.

JA1 Observations:

All batches met specification requirements for 2012.

Particulate Contamination is included in the JA1 tables and a histogram also has been added for this fuel property for 2012.

The minimum rating for **Water Separation Index** with SDA is 70. The minimum Water Separation Index rating without SDA is 85.

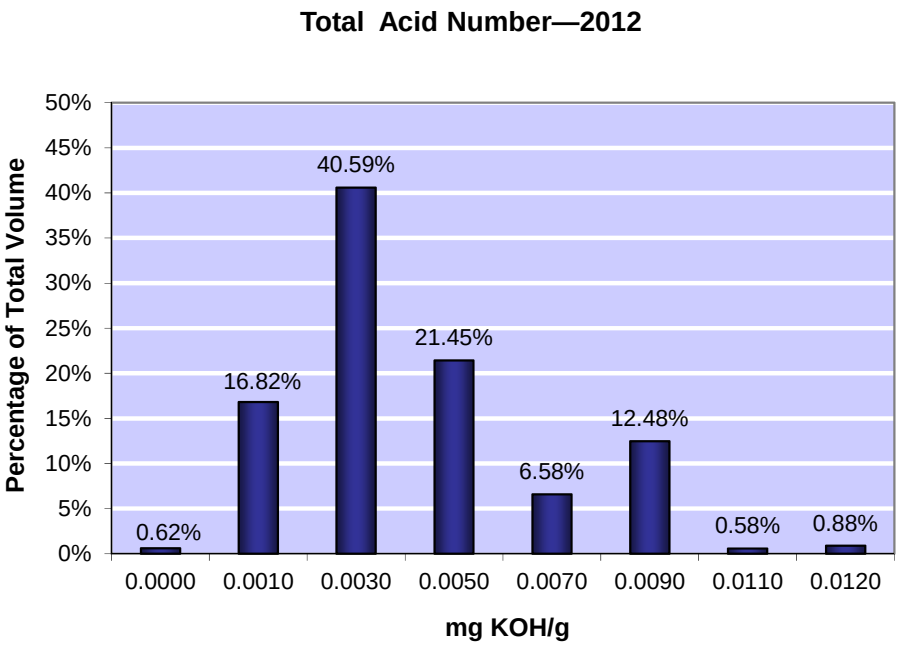


Figure 6-1: Total Acid Number (mg KOH/g), maximum 0.015

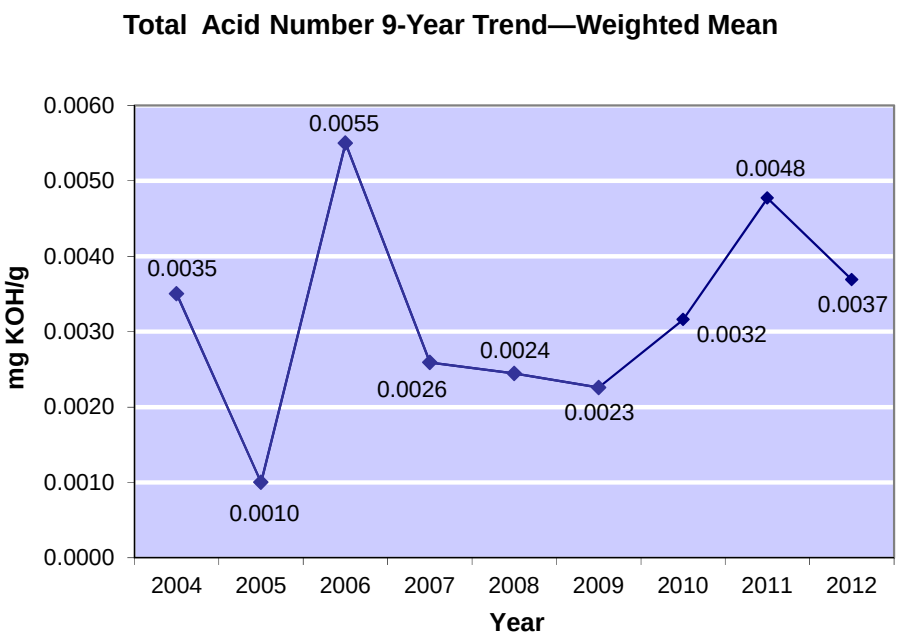


Figure 6-2: Total Acid Number (mg KOH/g), 9-Year Trend, maximum 0.015

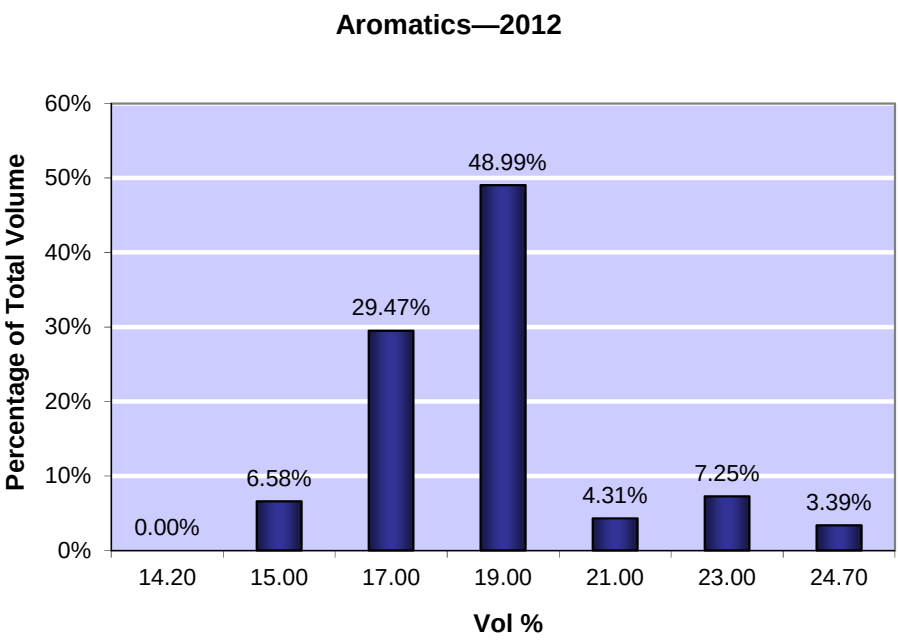


Figure 6-3: Aromatics (vol %), maximum 25.0

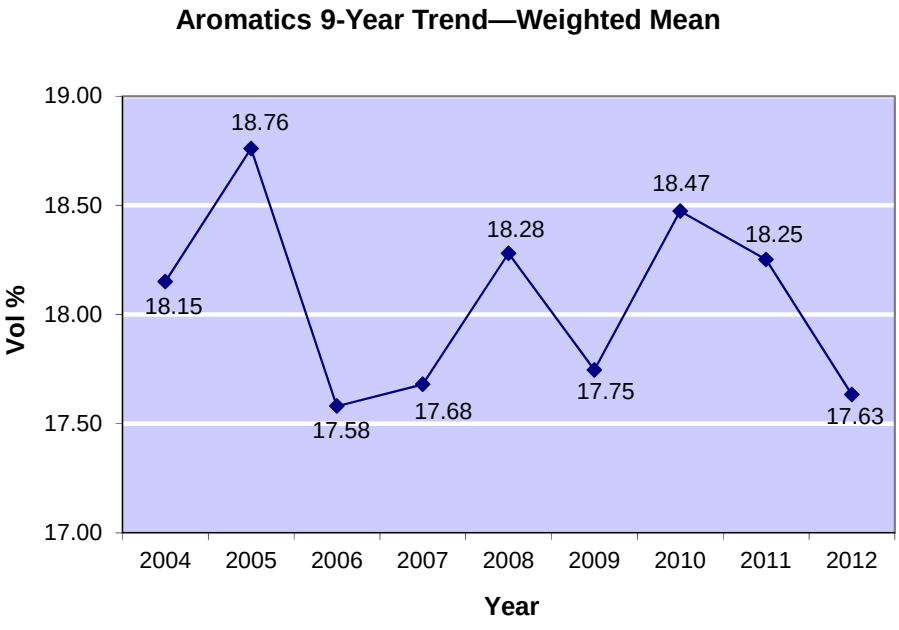


Figure 6-4: Aromatics (vol %), 9-Year Trend, maximum 25.0

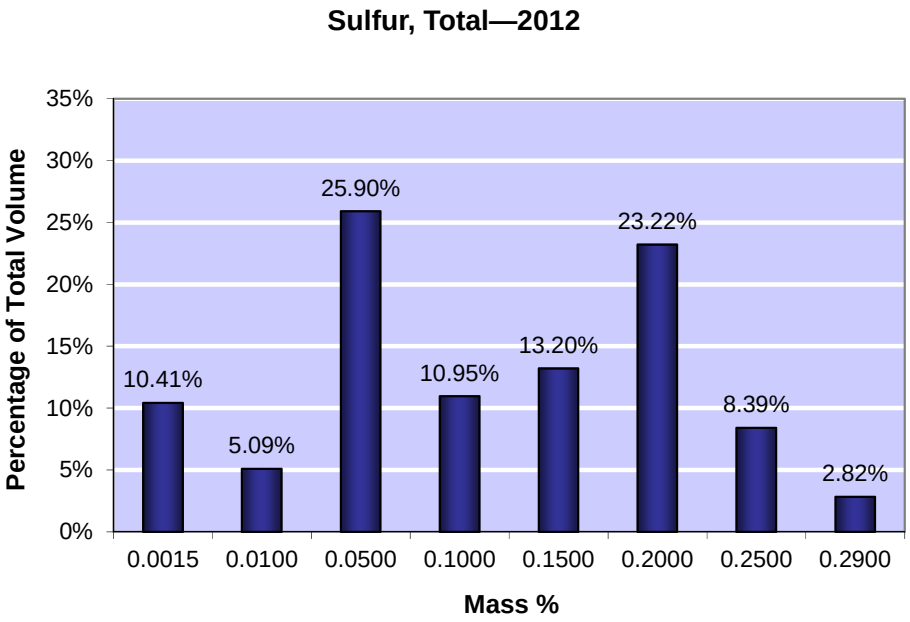


Figure 6-5: Sulfur, Total (mass %), maximum 0.30

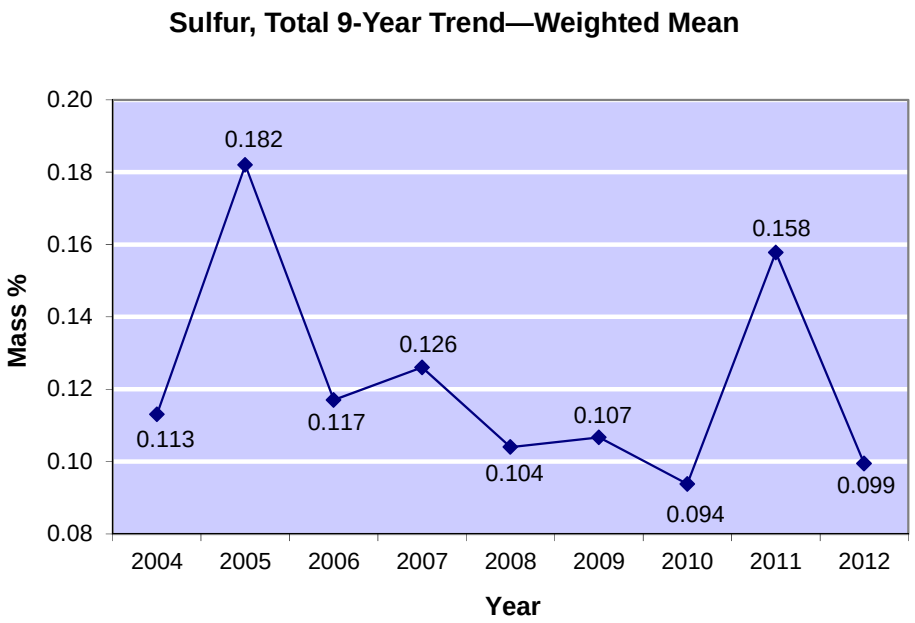


Figure 6-6: Sulfur, Total (mass %), 9-Year Trend, maximum 0.30

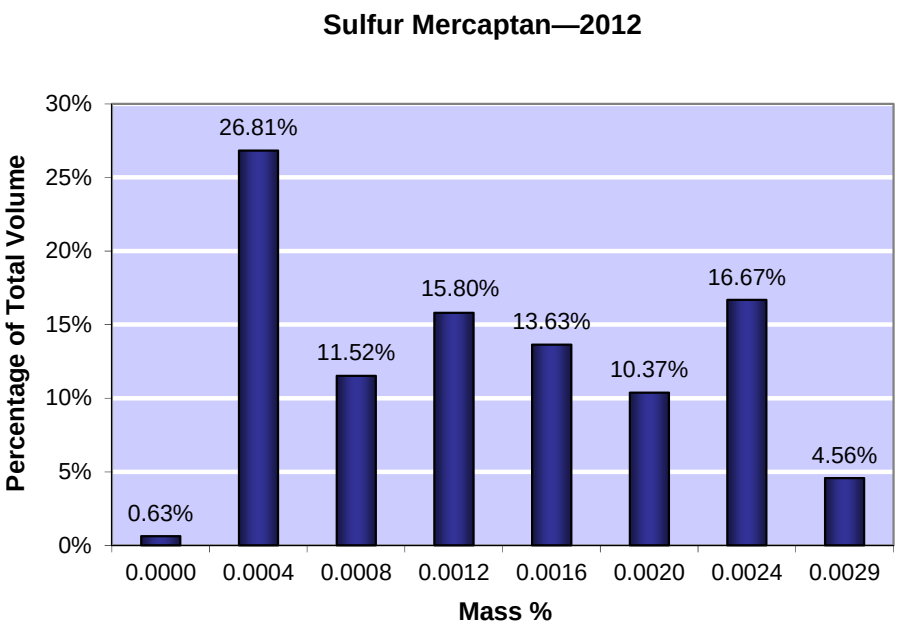


Figure 6-7: Sulfur Mercaptan (mass %), maximum 0.003

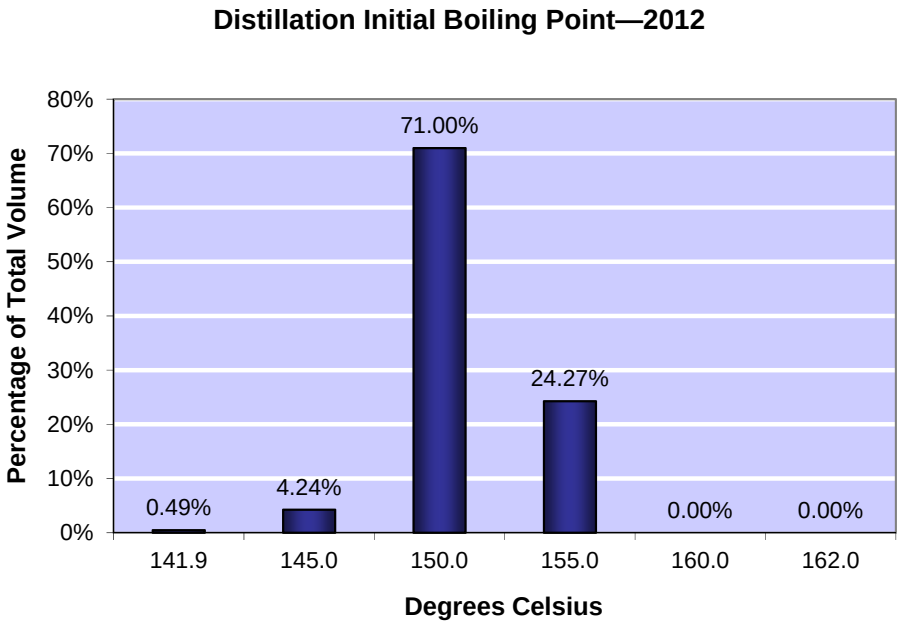


Figure 6-8: Distillation Initial Boiling Point (°C), Report

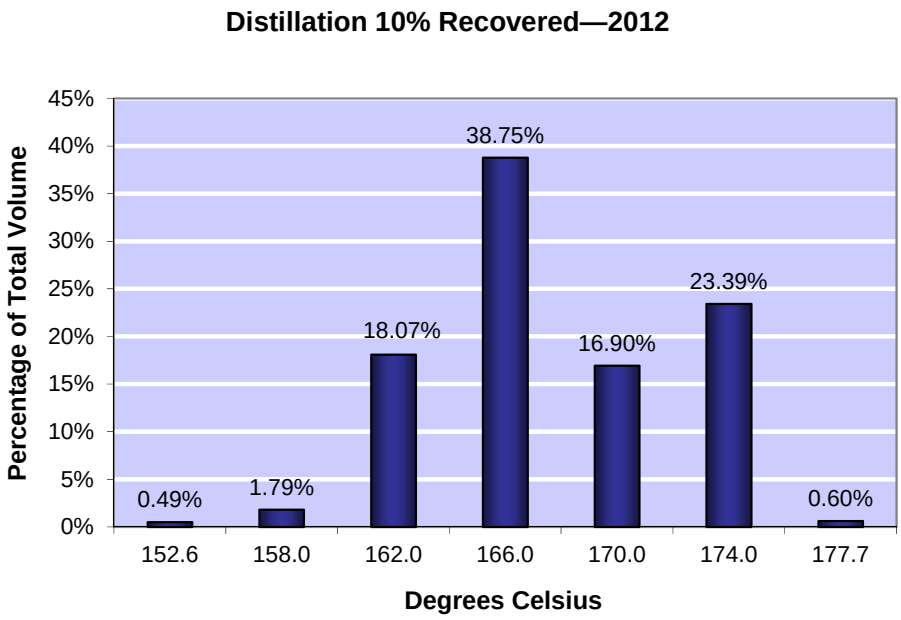


Figure 6-9: Distillation 10% Recovered (°C), maximum 205.0

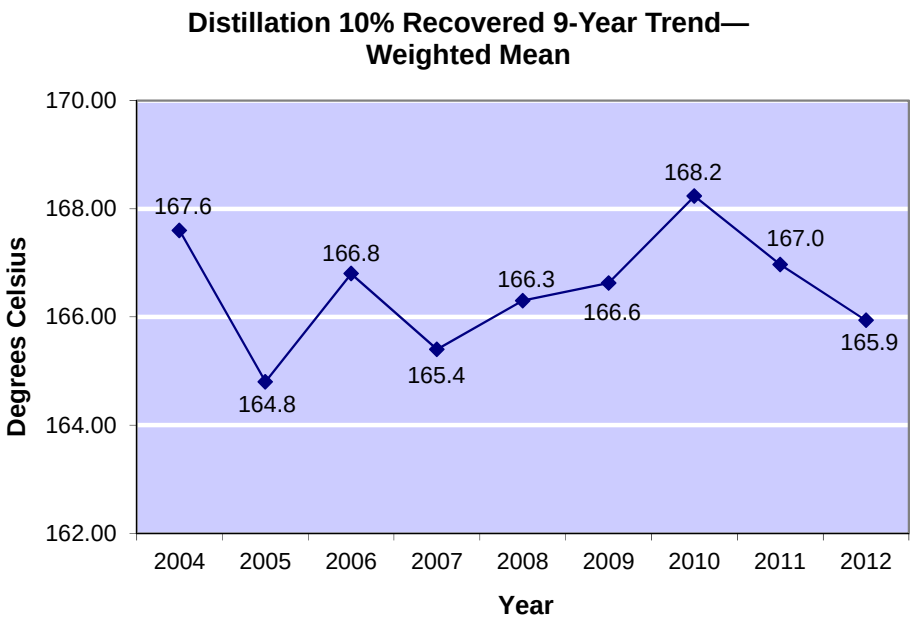


Figure 6-10: Distillation 10% Recovered (°C), 9-Year Trend, maximum 205.0

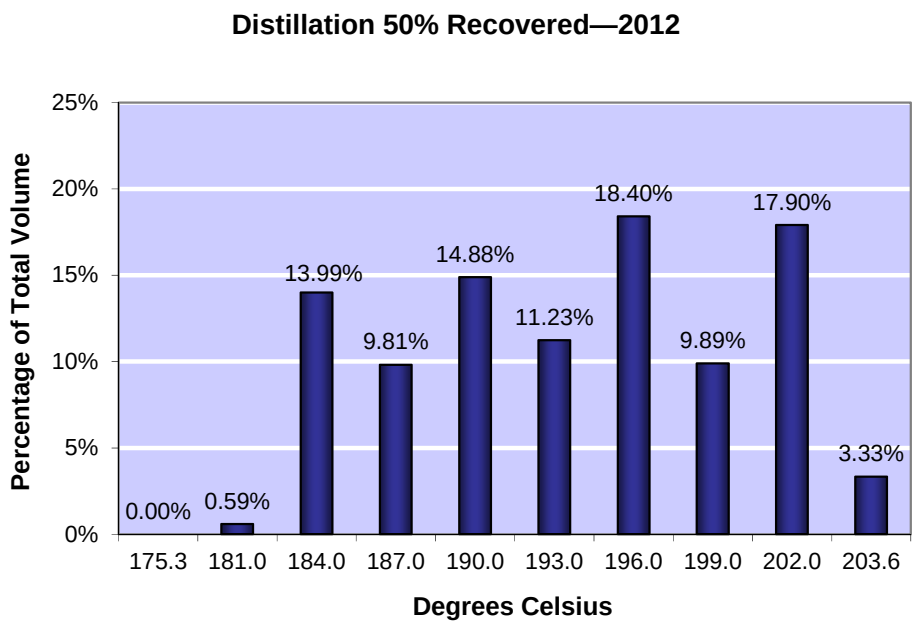


Figure 6-11: Distillation 50% Recovered (°C), Report

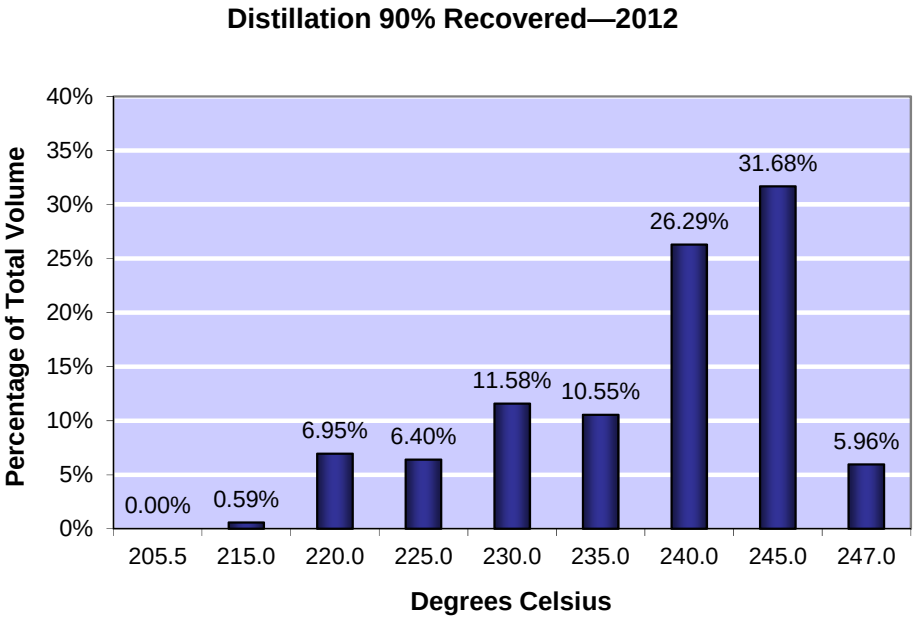


Figure 6-12: Distillation 90% Recovered (°C), Report

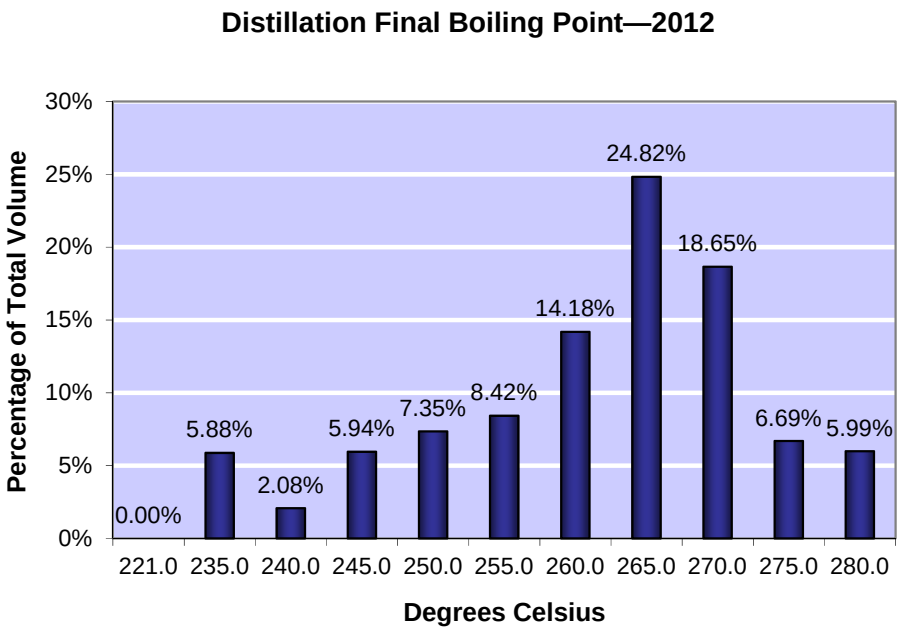


Figure 6-13: Distillation Final Boiling Point (°C), maximum 300.0

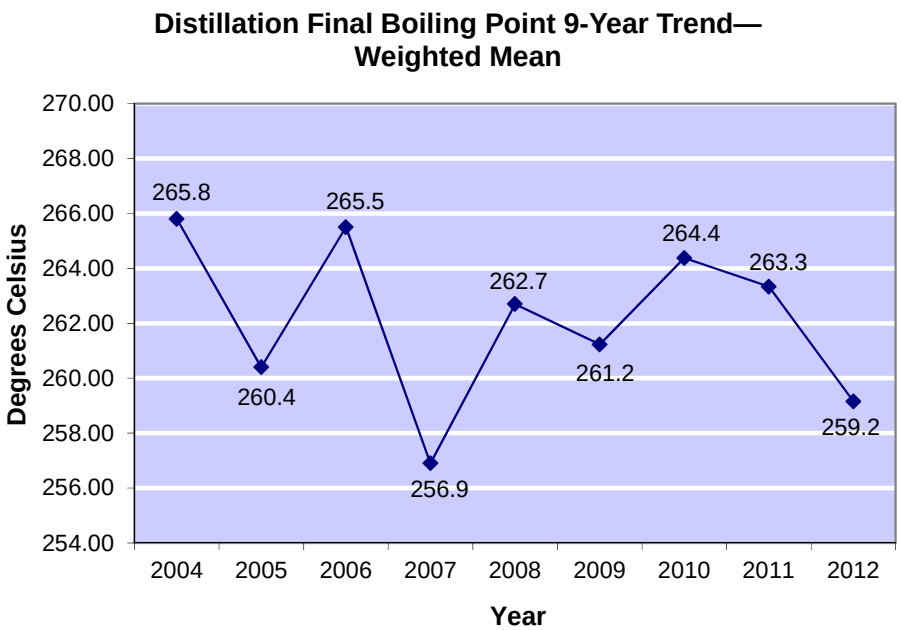


Figure 6-14: Distillation Final Boiling Point (°C), 9-Year Trend, maximum 300.0

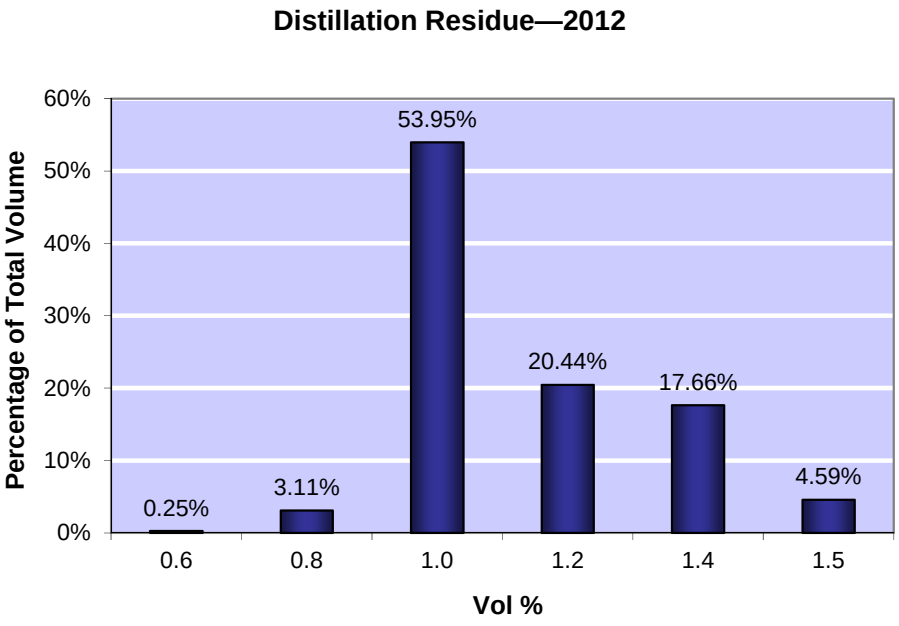


Figure 6-15: Distillation Residue (vol %), maximum 1.5

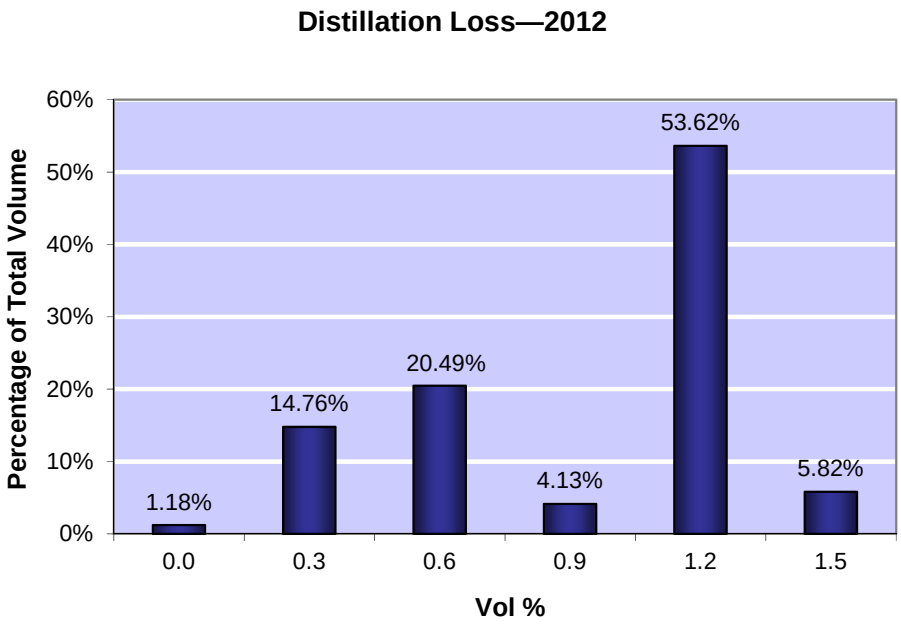


Figure 6-16: Distillation Loss (vol %), maximum 1.5

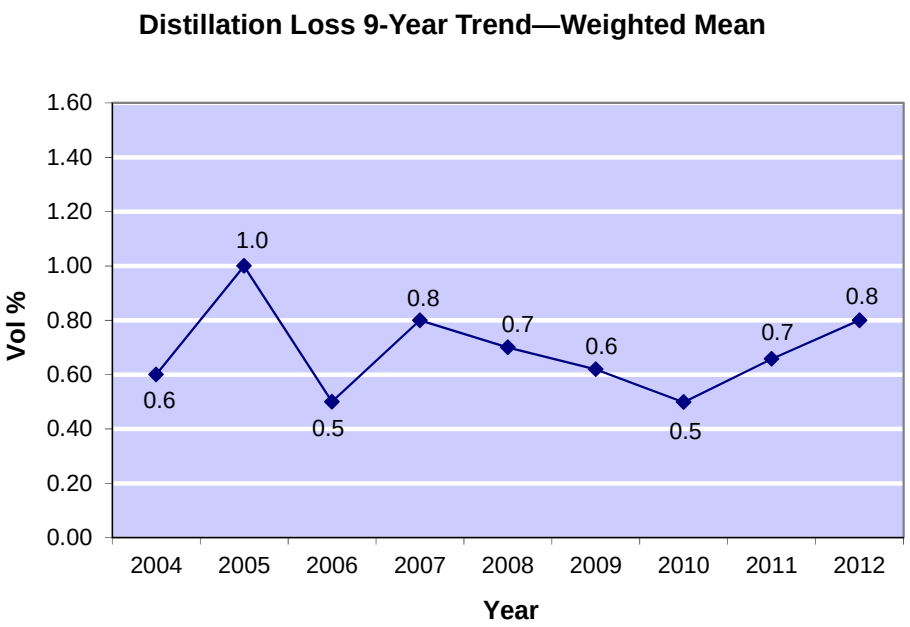


Figure 6-17: Distillation Loss (vol %), 9-Year Trend, maximum 1.5

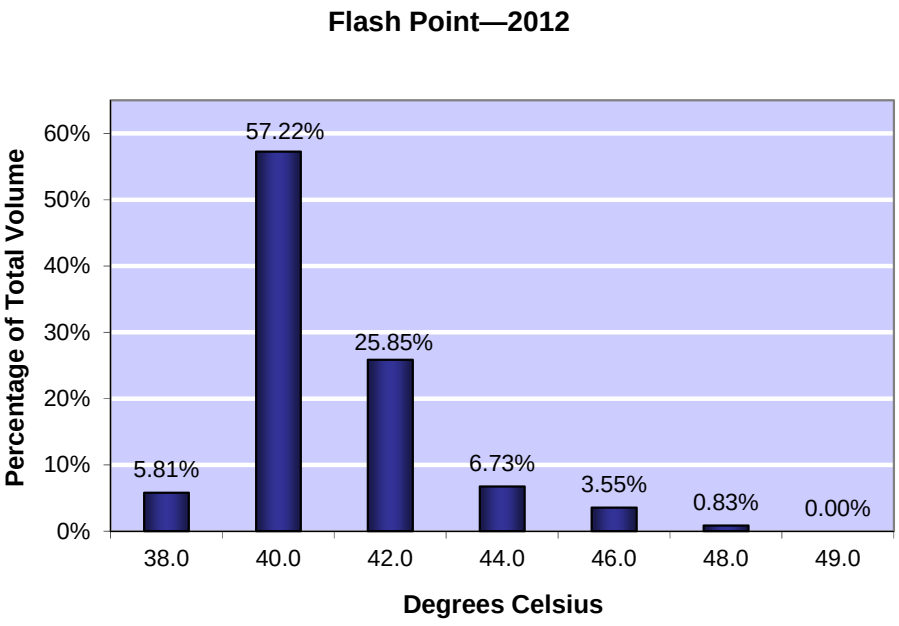


Figure 6-18: Flash Point (°C), minimum 38.0

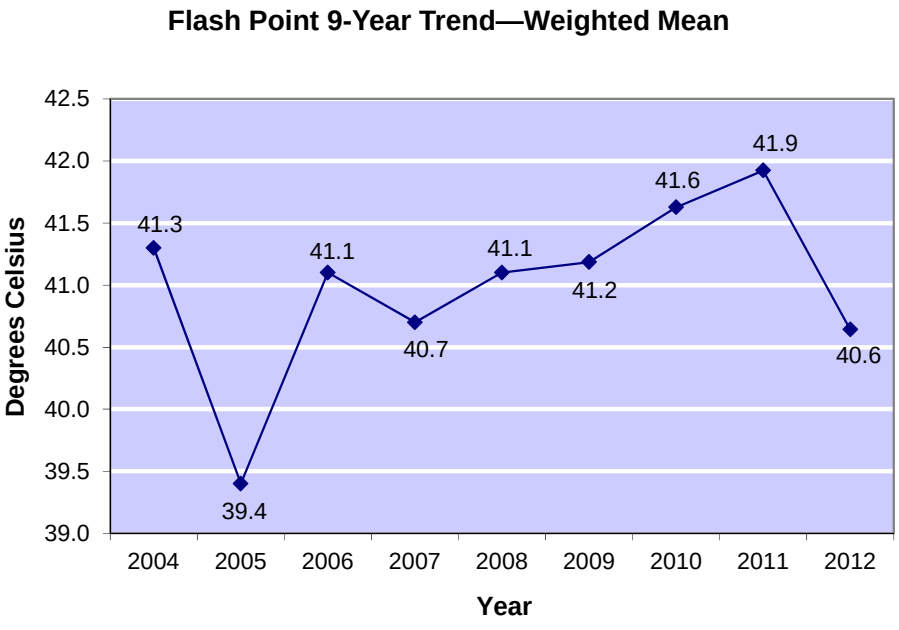


Figure 6-19: Flash Point (°C), 9-Year Trend, minimum 38.0

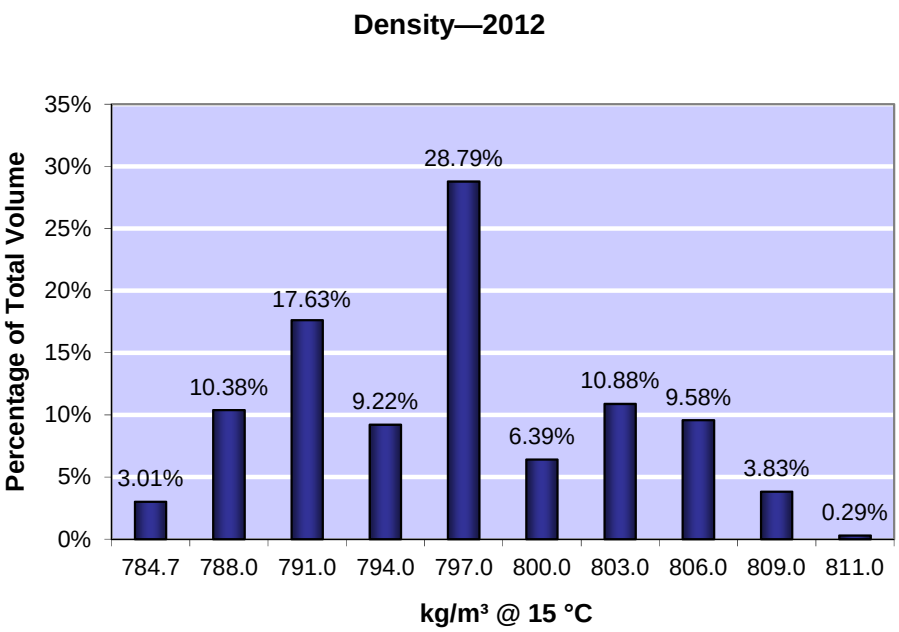


Figure 6-20: Density (kg/m^3 @ 15 °C), minimum 775, maximum 840

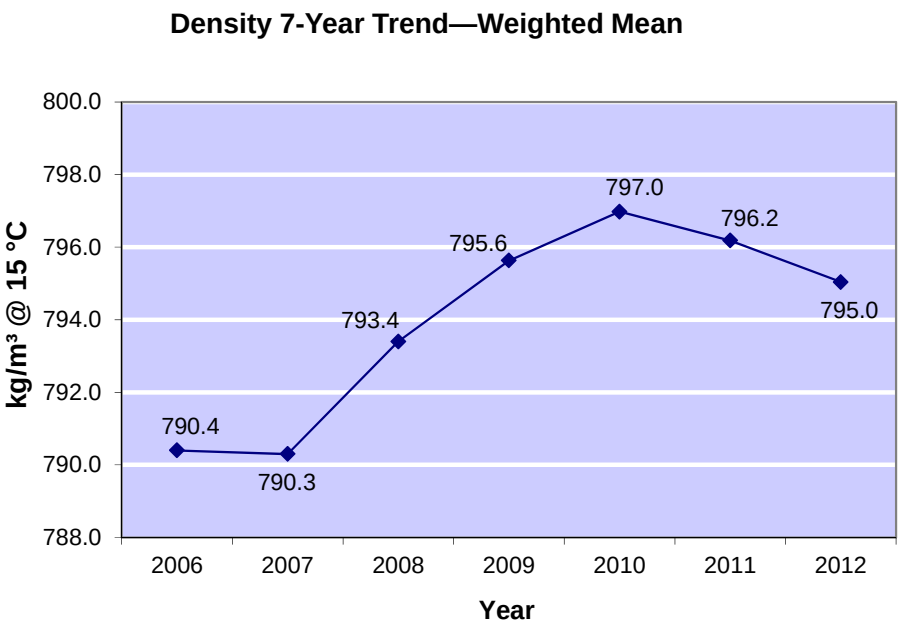


Figure 6-21: Density (kg/m^3 @ 15 °C), 7-Year Trend, minimum 775, maximum 840

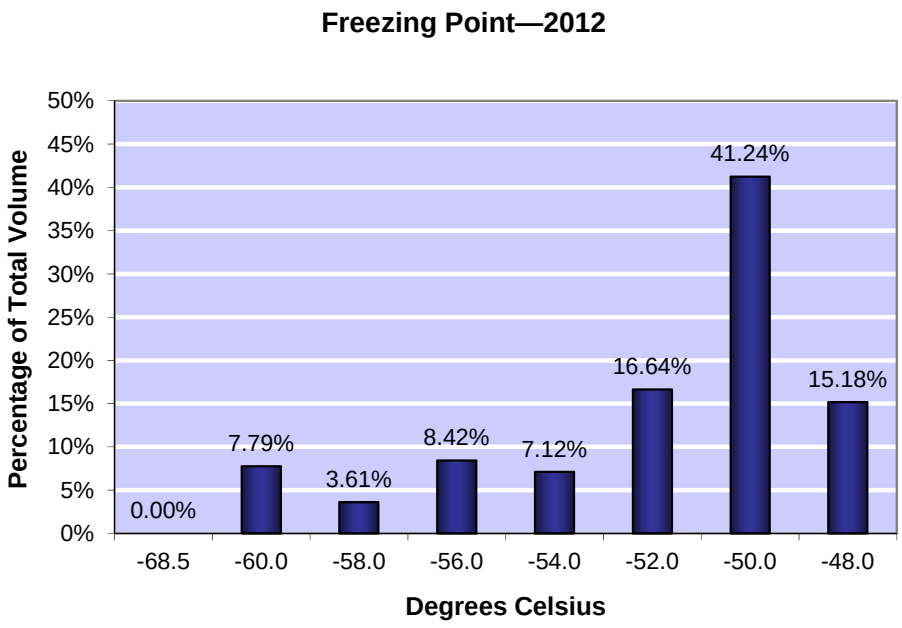


Figure 6-22: Freezing Point (°C), maximum –47

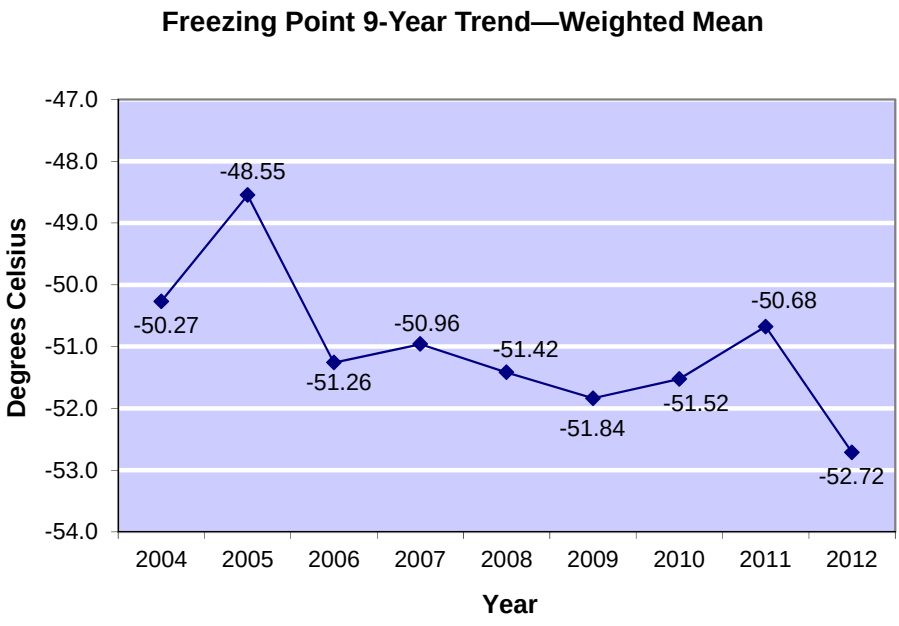


Figure 6-23: Freezing Point (°C), 9-Year Trend, maximum –47

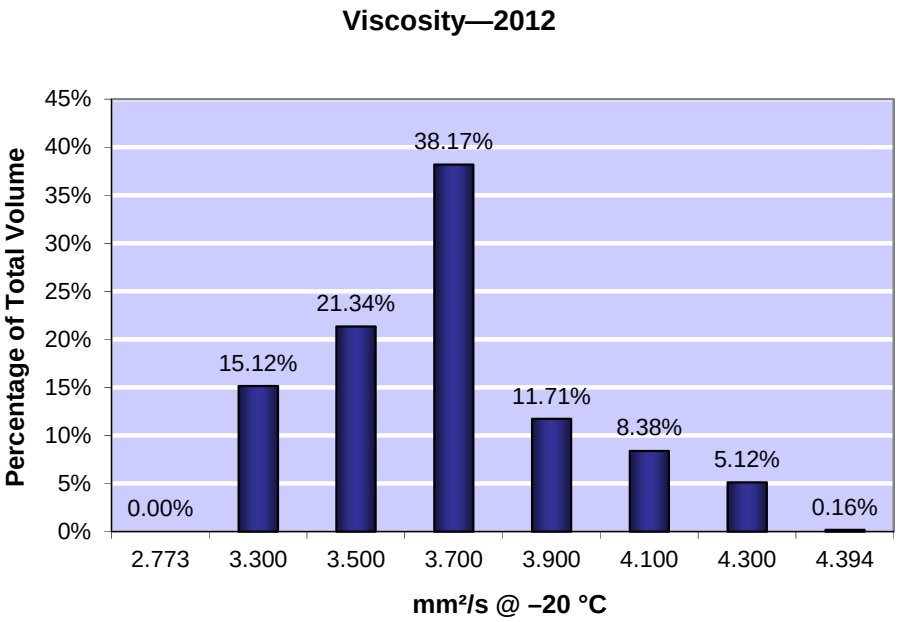


Figure 6-24: Viscosity (mm^2/s @ –20 °C), maximum 8.0

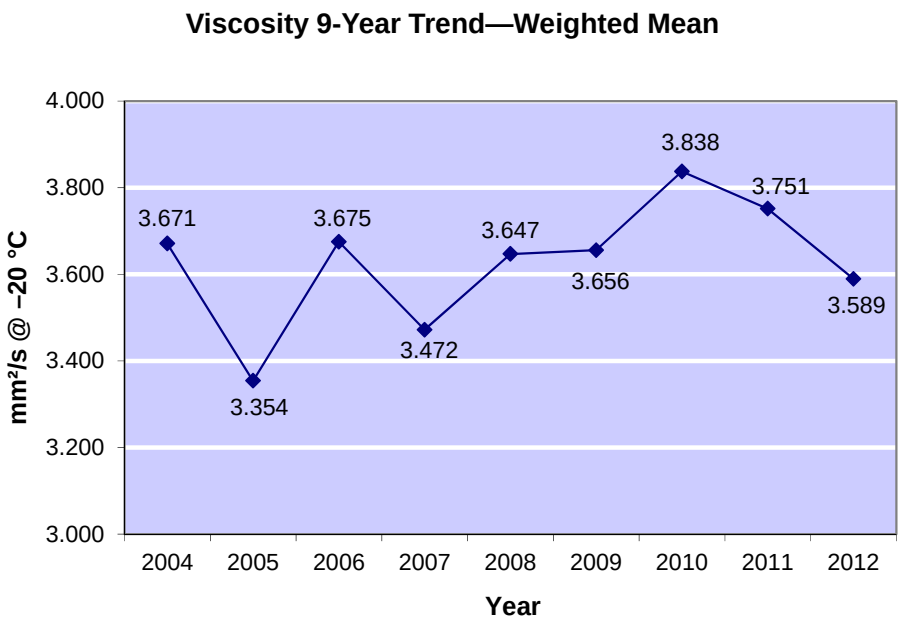


Figure 6-25: Viscosity (mm^2/s @ –20 °C), 9-Year Trend, maximum 8.0

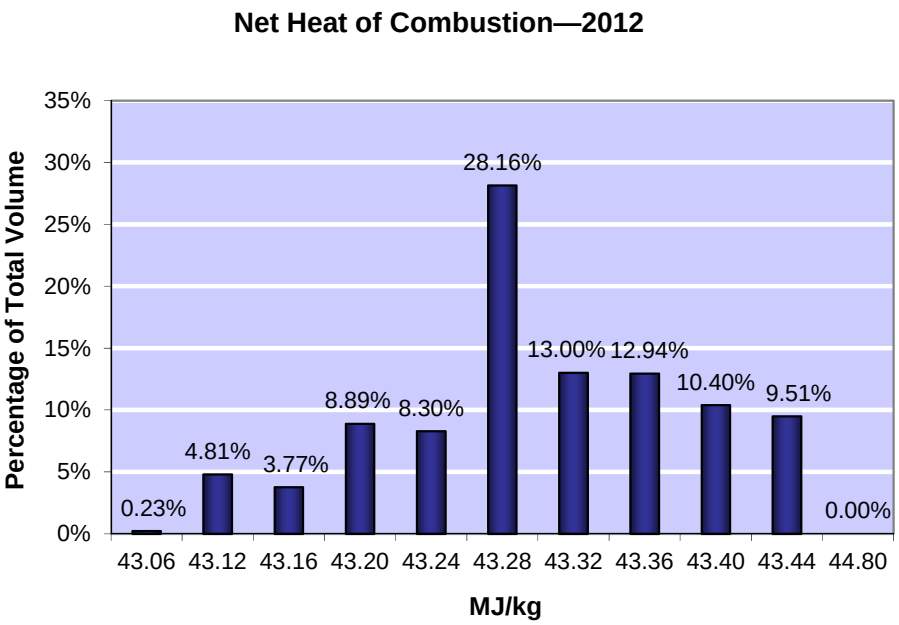


Figure 6-26: Net Heat of Combustion (MJ/kg), minimum 42.80

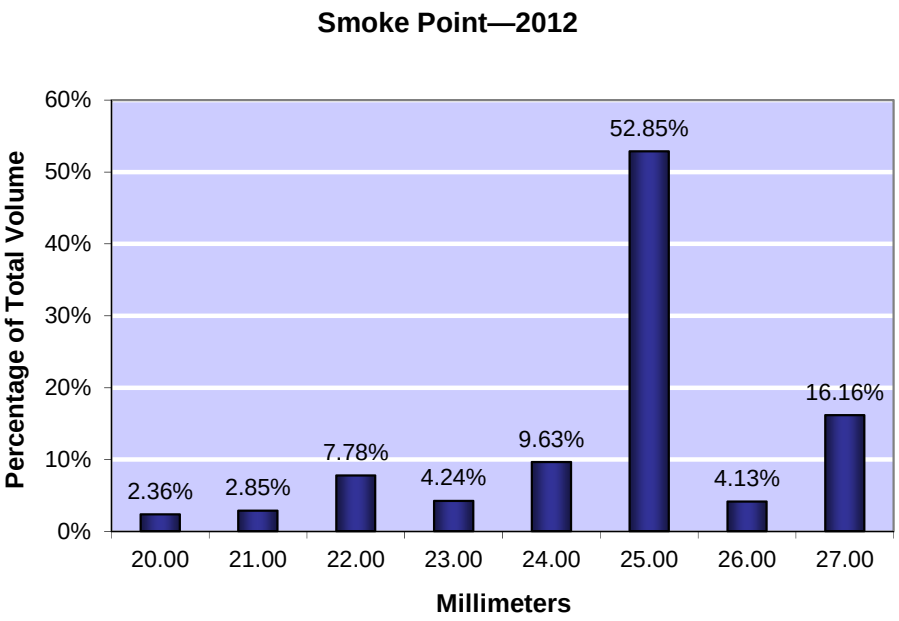


Figure 6-27: Smoke Point (mm), minimum 25.0

Note: When the smoke point result is below 25 mm, the product is acceptable so long as the naphthalene content is below 3.0 percent and the smoke point is above the minimum of 19 mm.

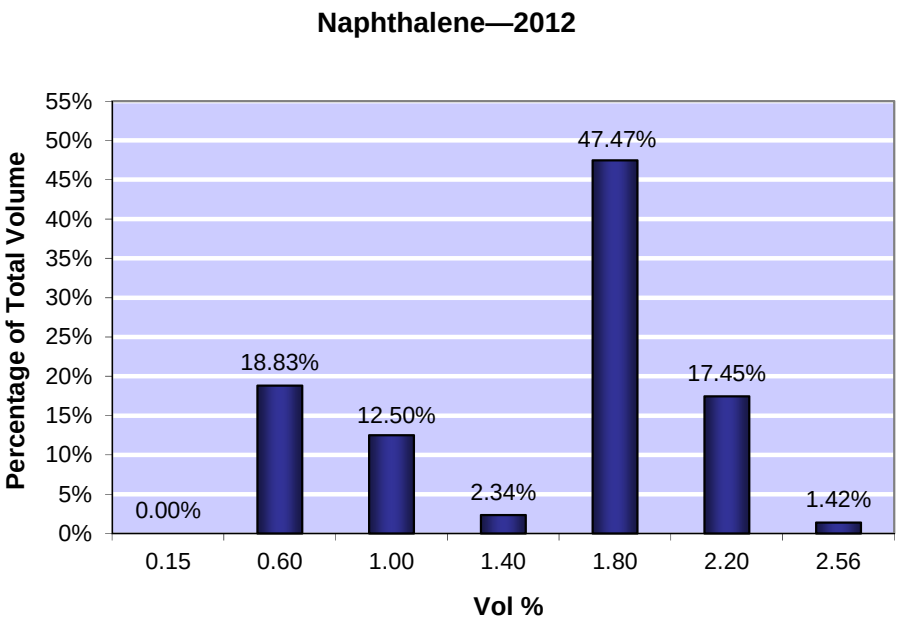


Figure 6-28: Naphthalene (vol %), maximum 3.0

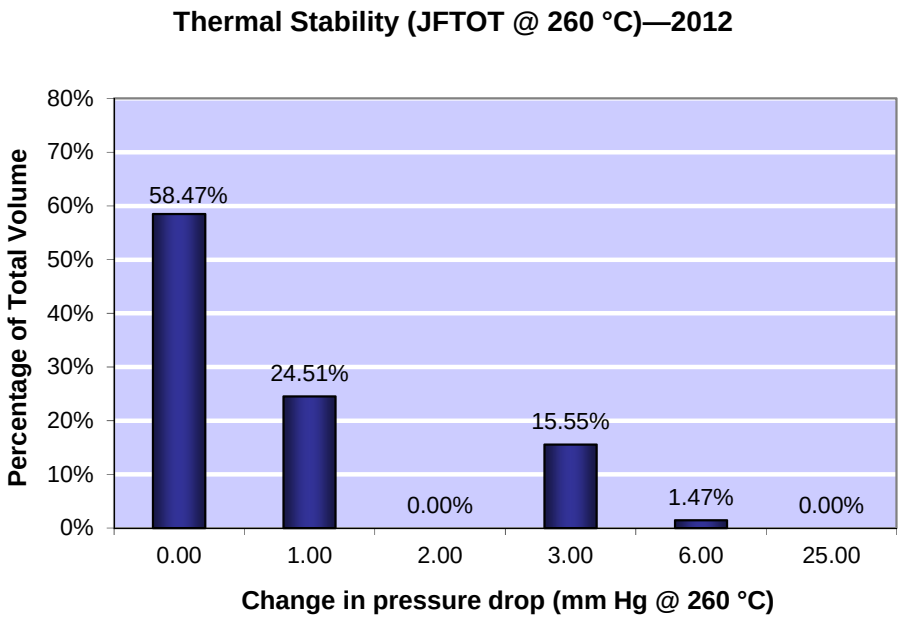


Figure 6-29: Thermal Stability, Change in Pressure Drop (mm Hg @ 260 °C), maximum 25

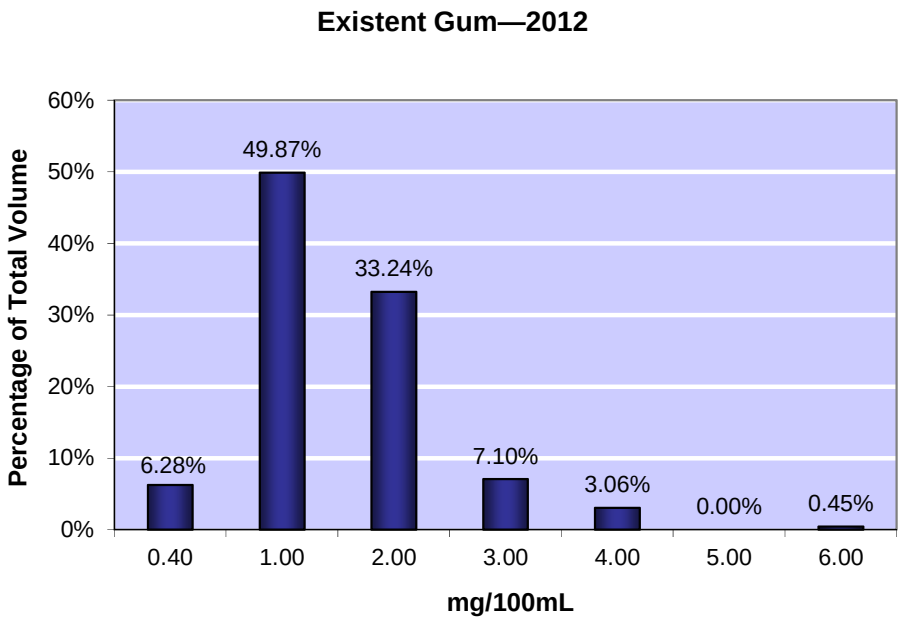


Figure 6-30: Existent Gum (mg/100 mL), maximum 7.0

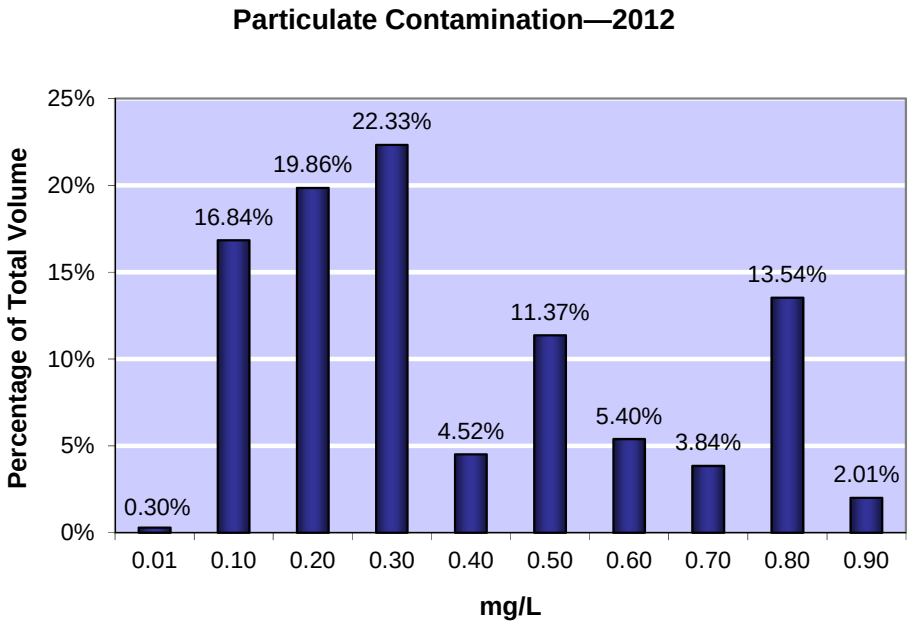


Figure 6-31: Particulate Contamination (mg/L), maximum 1.0

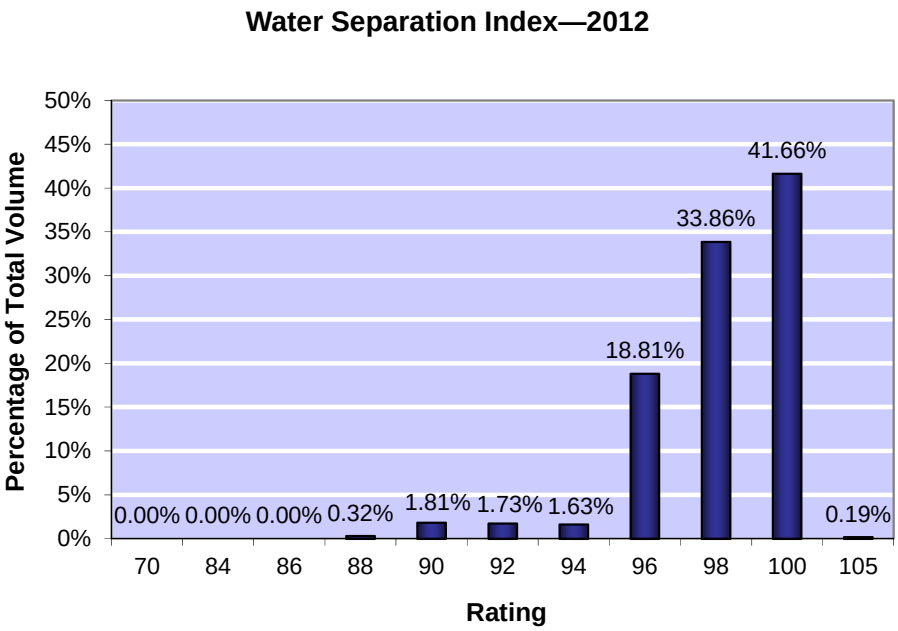


Figure 6-32: Water Separation Index (rating), minimum 70

Note: The minimum Water Separation Index rating with SDA is 70. The minimum Water Separation Index rating without SDA is 85.

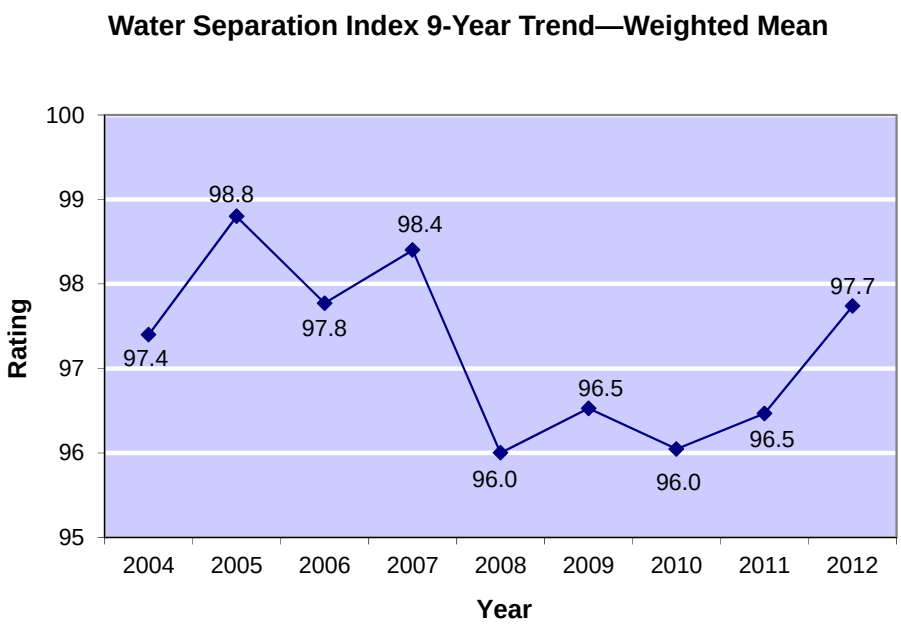


Figure 6-33: Water Separation Index (rating), 9-Year Trend, minimum 70

7. F76—2012 Data Summary

MIL-DTL-16884 Fuel, Naval Distillate (NATO Code F-76)			
Property	**2012 Source Inputs**		
	Region	**Volume**	**Batches**
Acid Number: (mg KOH/g)	All	428.47	112
Sulfur Content: (wt. %)	All	428.47	112
Distillation:			
10% Point, (°C)	All	437.56	115
50% Point, (°C)	All	437.56	115
90% Point, (°C)	All	437.56	115
End Point, (°C)	All	437.56	115
Residue + Loss, (vol %)	All	437.56	115
Flash Point: (°C)	All	442.39	116
Density: (kg/m^3 @ 15 °C)	All	427.47	113
Viscosity: (mm^2/s @ 40 °C)	All	428.47	112
Cetane Index: (calculated)	All	394.48	96
Hydrogen Content: (wt. %)	All	428.47	98
Cloud Point: (°C)	All	428.47	102
Pour Point: (°C)	All	428.47	112
Ash: (wt. %)	All	428.47	112
Particulate Contamination: (mg/L)	All	442.39	112
Carbon Residue on 10% Bottoms:			
D-524 (wt. %)	All	183.87	54
D-189 & D-4530 (wt. %)	All	250.61	60
Demulsification: (minutes @ 25 °C)	All	389.66	103
Color:	All	478.49	110
Storage Stability:			
D-2274 (mg/100mL)	All	144.05	41
D-5304 (mg/100mL)	All	284.43	71
Calcium: (ppm)	All	428.47	112
Lead: (ppm)	All	420.82	110
Sodium + Potassium: (ppm)	All	428.47	112
Vanadium: (ppm)	All	428.47	112

Table 7-1: Data Summary, MIL-DTL-16884 Fuel, Naval Distillate (NATO F-76), 2012 Source Inputs

MIL-DTL-16884 Fuel, Naval Distillate (NATO Code F-76)						
Property	**Specification Limits**		**2012 Test Results**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Acid Number: (mg KOH/g)		**0.30**	0.001	0.290	0.109	0.103
Sulfur Content:[1] (wt. %)		**0.5**	0.0009	0.4900	0.243	0.258
Distillation:						
10% Point, (°C)	**Report**		190.2	266.0	217.5	218.6
50% Point, (°C)	**Report**		227.8	295.0	271.0	273.8
90% Point, (°C)		**357**	296.0	354.0	330.2	332.3
End Point, (°C)		**385**	317.0	382.0	358.4	360.5
Residue + Loss, (vol %)		**3.0**	0.1	2.9	1.99	1.93
Flash Point: (°C)	**60**		60.0	89.0	69.76	70.22
Density: (kg/m^3 @ 15 °C)		**876**	823.7	868.2	848.4	845.8
Viscosity: (mm^2/s @ 40 °C)	**1.7**	**4.3**	1.912	4.193	2.919	3.005
Cetane Index: (calculated)	**43**		43.50	58.30	49.59	50.62
Hydrogen Content: (wt. %)	**12.5**		12.50	15.31	13.35	13.49
Cloud Point: (°C)		**–1**	–37.0	–1.0	–10.5	–8.4
Pour Point: (°C)		**–6**	–48.0	–6.0	–17.4	–15.1
Ash: (wt. %)		**0.005**	0.0000	0.0050	0.0011	0.0011
Particulate Contamination: (mg/L)		**10**	0.10	8.80	2.75	2.57
Carbon Residue on 10% Bottoms:						
D-524 (wt. %)		**0.20**	0.010	0.190	0.120	0.120
D-189 & D-4530 (wt. %)		**0.14**	0.000	0.120	0.033	0.027
Demulsification: (minutes @ 25 °C)		**10**	1.00	10.00	3.62	3.44
Color:		**3**	0.50	3.00	1.09	1.02
Storage Stability:						
D-2274 (mg/100mL)		**1.5**	0.00	1.40	0.48	0.50
D-5304 (mg/100mL)		**3.0**	0.10	11.20	1.78	1.30
Calcium: (ppm)		**1.0**	0.00	1.00	0.13	0.14
Lead: (ppm)		**0.5**	0.00	0.50	0.11	0.11
Sodium + Potassium: (ppm)		**1.0**	0.00	1.00	0.21	0.23
Vanadium: (ppm)		**0.5**	0.00	0.50	0.09	0.09

Table 7-2: Data Summary, MIL-DTL-16884 Fuel, Naval Distillate (NATO F-76), 2012 Test Results

Note 1: The MIL-DTL-16884 Sulfur Content maximum limit was changed to 0.1 mass % in August 2012. Eighty-nine measurements exceeded this limit in 2012.

7. F76—2012 Regional Data Summary

MIL-DTL-16884 Fuel, Naval Distillate (NATO Code F-76)						
Property	Total Volume		129.28			
	Batch Analysis		29			
	Specification Limits		Region 3			
	Min	Max	Min	Max	Mean	Wt Mean
Acid Number: (mg KOH/g)		**0.30**	0.001	0.230	0.117	0.122
Sulfur Content: (wt. %)		**0.5**	0.0849	0.4330	0.275	0.266
Distillation:						
10% Point, (°C)	**Report**		196.8	223.4	209.1	209.2
50% Point, (°C)	**Report**		236.5	277.0	264.0	264.7
90% Point, (°C)		**357**	304.0	340.8	331.7	331.8
End Point, (°C)		**385**	345.8	366.2	358.9	359.1
Residue + Loss, (vol %)		**3.0**	1.3	2.7	2.19	2.23
Flash Point: (°C)	**60**		60.0	73.0	64.38	64.39
Density: (kg/m^3 @ 15 °C)		**876**	828.5	865.5	853.0	851.7
Viscosity: (mm^2/s @ 40 °C)	**1.7**	**4.3**	2.100	3.151	2.635	2.668
Cetane Index: (calculated)	**43**		43.50	52.80	45.41	45.97
Hydrogen Content: (wt. %)	**12.5**		12.50	14.50	12.89	12.95
Cloud Point: (°C)		**–1**	–20.0	–4.0	–11.5	–11.2
Pour Point: (°C)		**–6**	–25.0	–9.0	–17.7	–17.3
Ash: (wt. %)		**0.005**	0.0000	0.0040	0.0011	0.0011
Particulate Contamination: (mg/L)		**10**	1.50	8.80	3.56	3.34
Carbon Residue on 10% Bottoms:						
D-524 (wt. %)		**0.20**	0.060	0.170	0.132	0.126
D-189 & D-4530 (wt. %)		**0.14**	0.100	0.100	0.100	0.100
Demulsification: (minutes @ 25 °C)		**10**	1.00	10.00	4.90	4.88
Color:		**3**	0.50	1.50	1.33	1.27
Storage Stability:						
D-2274 (mg/100mL)		**1.5**	0.00	1.40	0.46	0.40
D-5304 (mg/100mL)		**3.0**	0.40	2.80	1.75	1.77
Calcium: (ppm)		**1.0**	0.00	0.40	0.12	0.11
Lead: (ppm)		**0.5**	0.00	0.40	0.10	0.09
Sodium + Potassium: (ppm)		**1.0**	0.00	0.40	0.18	0.17
Vanadium: (ppm)		**0.5**	0.00	0.40	0.11	0.10

Table 7-3: Region 3 Summary

MIL-DTL-16884 Fuel, Naval Distillate (NATO Code F-76)						
Property	Total Volume		50.42			
	Batch Analysis		20			
	Specification Limits		Region 5			
	Min	Max	Min	Max	Mean	Wt Mean
Acid Number: (mg KOH/g)		**0.30**	0.002	0.161	0.041	0.045
Sulfur Content: (wt. %)		**0.5**	0.0009	0.4710	0.064	0.085
Distillation:						
10% Point, (°C)	**Report**		190.2	232.9	214.7	215.1
50% Point, (°C)	**Report**		227.8	287.9	258.7	260.7
90% Point, (°C)		**357**	296.0	330.0	311.9	313.4
End Point, (°C)		**385**	317.0	352.6	339.8	341.3
Residue + Loss, (vol %)		**3.0**	1.3	2.9	2.29	2.23
Flash Point: (°C)	**60**		61.0	82.0	72.10	71.74
Density: (kg/m^3 @ 15 °C)		**876**	845.1	868.2	859.2	859.6
Viscosity: (mm^2/s @ 40 °C)	**1.7**	**4.3**	1.912	3.420	2.698	2.735
Cetane Index: (calculated)	**43**		49.50	53.30	50.80	51.02
Hydrogen Content: (wt. %)	**12.5**		13.00	14.80	13.35	13.41
Cloud Point: (°C)		**–1**	–37.0	–11.0	–26.6	–24.1
Pour Point: (°C)		**–6**	–48.0	–15.0	–34.5	–32.1
Ash: (wt. %)		**0.005**	0.0000	0.0020	0.0005	0.0005
Particulate Contamination: (mg/L)		**10**	0.48	7.50	2.19	2.28
Carbon Residue on 10% Bottoms:						
D-524 (wt. %)		**0.20**	0.010	0.190	0.124	0.108
D-189 & D-4530 (wt. %)		**0.14**	0.020	0.020	0.020	NR
Demulsification: (minutes @ 25 °C)		**10**	2.00	5.00	3.65	3.59
Color:		**3**	0.50	1.00	0.68	0.68
Storage Stability:						
D-2274 (mg/100mL)		**1.5**	0.10	1.40	0.51	0.52
D-5304 (mg/100mL)		**3.0**	0.10	2.20	0.75	0.23
Calcium: (ppm)		**1.0**	0.10	1.00	0.19	0.20
Lead: (ppm)		**0.5**	0.10	0.50	0.14	0.15
Sodium + Potassium: (ppm)		**1.0**	0.10	1.00	0.30	0.30
Vanadium: (ppm)		**0.5**	0.10	0.50	0.14	0.15

Table 7-4: Region 5 Summary

7. F76—2012 Regional Data Summary

MIL-DTL-16884 Fuel, Naval Distillate (NATO Code F-76)						
Property	**Total Volume**		**129.73**			
	Batch Analysis		**17**			
	Specification Limits		**Region 6**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Acid Number: (mg KOH/g)		**0.30**	0.020	0.290	0.125	0.151
Sulfur Content: (wt. %)		**0.5**	0.140	0.432	0.336	0.292
Distillation:						
10% Point, (°C)	**Report**		191.0	209.0	201.3	204.2
50% Point, (°C)	**Report**		265.0	281.0	273.6	275.7
90% Point, (°C)		**357**	330.0	346.0	339.5	337.2
End Point, (°C)		**385**	363.0	382.0	375.2	371.6
Residue + Loss, (vol %)		**3.0**	1.1	2.0	1.89	2.00
Flash Point: (°C)	**60**		62.0	74.0	66.87	68.60
Density: (kg/m^3 @ 15 °C)		**876**	823.7	833.3	828.6	829.9
Viscosity: (mm^2/s @ 40 °C)	**1.7**	**4.3**	2.541	3.111	2.833	2.929
Cetane Index: (calculated)	**43**		53.30	58.30	55.89	55.85
Hydrogen Content: (wt. %)	**12.5**		12.90	13.70	13.46	13.40
Cloud Point: (°C)		**–1**	–4.0	–1.0	–1.8	–2.3
Pour Point: (°C)		**–6**	–12.0	–6.0	–8.4	–7.5
Ash: (wt. %)		**0.005**	0.0010	0.0050	0.0013	0.0010
Particulate Contamination: (mg/L)		**10**	2.20	7.70	4.14	4.85
Carbon Residue on 10% Bottoms:						
D-524 (wt. %)		**0.20**	0.020	0.140	0.053	NR
D-189 & D-4530 (wt. %)		**0.14**	0.020	0.020	0.020	0.020
Demulsification: (minutes @ 25 °C)		**10**	1.00	6.00	2.80	2.00
Color:		**3**	1.00	1.50	1.38	1.37
Storage Stability:						
D-2274 (mg/100mL)		**1.5**	NR	NR	NR	NR
D-5304 (mg/100mL)		**3.0**	0.40	2.40	1.33	1.22
Calcium: (ppm)		**1.0**	0.10	0.80	0.16	0.10
Lead: (ppm)		**0.5**	0.10	0.40	0.20	0.27
Sodium + Potassium: (ppm)		**1.0**	0.10	0.98	0.19	0.10
Vanadium: (ppm)		**0.5**	0.10	0.38	0.12	0.10

Table 7-5: Region 6 Summary

MIL-DTL-16884 Fuel, Naval Distillate (NATO Code F-76)						
Property	Total Volume		40.37			
	Batch Analysis		10			
	Specification Limits		Region 7			
	Min	Max	Min	Max	Mean	Wt Mean
Acid Number: (mg KOH/g)		**0.30**	0.020	0.270	0.170	0.144
Sulfur Content: (wt. %)		**0.5**	0.094	0.490	0.277	0.276
Distillation:						
10% Point, (°C)	**Report**		195.6	238.4	223.9	219.3
50% Point, (°C)	**Report**		268.0	283.1	278.3	277.0
90% Point, (°C)		**357**	336.0	346.0	340.7	341.2
End Point, (°C)		**385**	365.9	375.3	369.8	370.3
Residue + Loss, (vol %)		**3.0**	0.1	2.5	1.28	1.43
Flash Point: (°C)	**60**		62.0	85.0	66.80	66.86
Density: (kg/m^3 @ 15 °C)		**876**	835.2	860.3	850.9	849.2
Viscosity: (mm^2/s @ 40 °C)	**1.7**	**4.3**	2.754	4.193	3.386	3.318
Cetane Index: (calculated)	**43**		47.10	52.10	49.47	49.81
Hydrogen Content: (wt. %)	**12.5**		13.01	15.31	13.63	13.82
Cloud Point: (°C)		**–1**	–5.0	–1.0	–2.5	–2.7
Pour Point: (°C)		**–6**	–18.0	–6.0	–9.3	–10.1
Ash: (wt. %)		**0.005**	0.0010	0.0050	0.0027	0.0025
Particulate Contamination: (mg/L)		**10**	1.50	4.80	3.09	2.97
Carbon Residue on 10% Bottoms:						
D-524 (wt. %)		**0.200**	NR	NR	NR	NR
D-189 & D-4530 (wt. %)		**0.140**	0.030	0.120	0.074	0.072
Demulsification: (minutes @ 25 °C)		**10**	2.00	5.00	3.00	3.37
Color:		**3**	0.50	1.50	1.10	1.10
Storage Stability:						
D-2274 (mg/100mL)		**1.5**	0.55	0.80	0.68	0.67
D-5304 (mg/100mL)		**3.0**	0.60	2.70	1.79	1.60
Calcium: (ppm)		**1.0**	0.00	0.10	0.03	0.04
Lead: (ppm)		**0.5**	0.00	0.20	0.05	0.06
Sodium + Potassium: (ppm)		**1.0**	0.07	0.70	0.30	0.26
Vanadium: (ppm)		**0.5**	0.00	0.10	0.03	0.04

Table 7-6: Region 7 Summary

7. F76—2012 Regional Data Summary

MIL-DTL-16884 Fuel, Naval Distillate (NATO Code F-76)						
Property	Total Volume		157.24			
	Batch Analysis		29			
	Specification Limits		Region 8			
	Min	Max	Min	Max	Mean	Wt Mean
Acid Number: (mg KOH/g)		**0.30**	0.020	0.248	0.096	0.071
Sulfur Content: (wt. %)		**0.5**	0.163	0.470	0.279	0.291
Distillation:						
10% Point, (°C)	**Report**		196.9	266.0	235.7	233.4
50% Point, (°C)	**Report**		265.8	295.0	283.7	284.0
90% Point, (°C)		**357**	320.0	354.0	332.6	334.8
End Point, (°C)		**385**	345.2	379.5	358.7	361.1
Residue + Loss, (vol %)		**3.0**	1.0	2.5	1.85	1.67
Flash Point: (°C)	**60**		60.0	89.0	76.28	76.04
Density: (kg/m^3 @ 15 °C)		**876**	833.7	858.8	843.8	843.6
Viscosity: (mm^2/s @ 40 °C)	**1.7**	**4.3**	2.757	4.060	3.383	3.349
Cetane Index: (calculated)	**43**		46.50	55.60	52.58	52.63
Hydrogen Content: (wt. %)	**12.5**		13.15	14.50	13.71	13.95
Cloud Point: (°C)		**–1**	–12.0	–1.0	–5.4	–4.8
Pour Point: (°C)		**–6**	–18.0	–6.0	–11.6	–12.1
Ash: (wt. %)		**0.005**	0.0000	0.0010	0.0008	0.0009
Particulate Contamination: (mg/L)		**10**	0.10	4.20	1.01	0.99
Carbon Residue on 10% Bottoms:						
D-524 (wt. %)		**0.200**	0.100	0.100	0.100	0.100
D-189 & D-4530 (wt. %)		**0.140**	0.000	0.058	0.015	0.015
Demulsification: (minutes @ 25 °C)		**10**	1.00	5.00	2.91	2.67
Color:		**3**	0.50	1.50	0.71	0.67
Storage Stability:						
D-2274 (mg/100mL)		**1.5**	0.00	1.30	0.43	0.51
D-5304 (mg/100mL)		**3.0**	0.70	1.00	0.94	0.95
Calcium: (ppm)		**1.0**	0.00	0.80	0.14	0.21
Lead: (ppm)		**0.5**	0.00	0.10	0.06	0.06
Sodium + Potassium: (ppm)		**1.0**	0.00	0.70	0.21	0.30
Vanadium: (ppm)		**0.5**	0.00	0.30	0.05	0.07

Table 7-7: Region 8 Summary

MIL-DTL-16884 Fuel, Naval Distillate (NATO Code F-76)						
Property	Total Volume		NR			
	Batch Analysis		11			
	Specification Limits		Region 9			
	Min	Max	Min	Max	Mean	Wt Mean
Acid Number: (mg KOH/g)		**0.30**	0.100	0.230	0.163	NR
Sulfur Content: (wt. %)		**0.5**	0.141	0.324	0.257	NR
Distillation:						
10% Point, (°C)	**Report**		210.3	222.9	215.0	NR
50% Point, (°C)	**Report**		262.1	276.7	269.7	NR
90% Point, (°C)		**357**	329.4	333.8	332.2	NR
End Point, (°C)		**385**	355.2	361.4	358.8	NR
Residue + Loss, (vol %)		**3.0**	1.3	2.6	1.91	NR
Flash Point: (°C)	**60**		66.0	74.0	68.82	NR
Density: (kg/m^3 @ 15 °C)		**876**	852.6	861.3	857.5	NR
Viscosity: (mm^2/s @ 40 °C)	**1.7**	**4.3**	2.486	3.100	2.737	NR
Cetane Index: (calculated)	**43**		43.70	49.60	45.36	NR
Hydrogen Content: (wt. %)	**12.5**		NR	NR	NR	NR
Cloud Point: (°C)		**–1**	–11.0	–8.0	–10.0	NR
Pour Point: (°C)		**–6**	–21.0	–15.0	–17.7	NR
Ash: (wt. %)		**0.005**	0.0010	0.0010	0.0010	NR
Particulate Contamination: (mg/L)		**10**	0.80	8.70	5.34	NR
Carbon Residue on 10% Bottoms:						
D-524 (wt. %)		**0.200**	NR	NR	NR	NR
D-189 & D-4530 (wt. %)		**0.140**	0.010	0.080	0.045	NR
Demulsification: (minutes @ 25 °C)		**10**	2.00	6.00	3.40	NR
Color:		**3**	1.50	3.00	2.60	NR
Storage Stability:						
D-2274 (mg/100mL)		**1.5**	NR	NR	NR	NR
D-5304 (mg/100mL)		**3.0**	1.50	11.20	3.77	NR
Calcium: (ppm)		**1.0**	0.10	0.10	0.10	NR
Lead: (ppm)		**0.5**	0.10	0.10	0.10	NR
Sodium + Potassium: (ppm)		**1.0**	0.10	0.20	0.15	NR
Vanadium: (ppm)		**0.5**	0.10	0.10	0.10	NR

Table 7-8: Region 9 Summary

7. F76—Assessment Summary

Overview:

In 2012, 118 reported analyses, representing 507.04 million U.S. gallons of F76, were processed by Regions 3, 5, 6, 7, 8, and 9. This represents an increase from the 110 reported F76 analyses in 2011, but a decrease in volume from the 598.46 million U.S. gallons queried from the PQIS in 2011.

Significant Trending:

Acid Number. The weighted mean increased 0.0226 mg KOH/g from 2011 to 2012.

Sulfur Content. The weighted mean decreased 0.03 wt. % from 2011 to 2012 after having increased 0.08 wt. % from 2010 to 2011.

Flash Point. The weighted mean increased 1.9 °C from 2010 to 2012.

Density. The weighted mean increased 3.2 kg/m^3 @ 15 °C from 2011 to 2012 after having decreased 1.4 kg/m^3 @ 15 °C from 2009 to 2011.

Viscosity. The weighted mean increased 0.195 mm^2/s @ 40 °C from 2010 to 2012 after having decreased 0.354 mm^2/s @ 40 °C from 2008 to 2010.

Cloud Point. The weighted mean decreased 1.3 °C from 2011 to 2012 after having increased 4.6 °C from 2010 to 2011.

Particulate Matter. The weighted mean increased 0.78 mg/L from 2011 to 2012 after having decreased 0.72 mg/L from 2009 to 2011.

F76 Observations:

The MIL-DTL-16884 **Sulfur Content** maximum limit was changed to 0.1 mass % in August 2012. Eighty-nine measurements exceeded this limit in 2012. No F76 measurements exceeded the previous maximum limit of 0.5 mass % in 2012.

Four **Storage Stability (test method ASTM D-2274)** measurements exceeded the maximum specification limit of 3.0 mg/100mL.

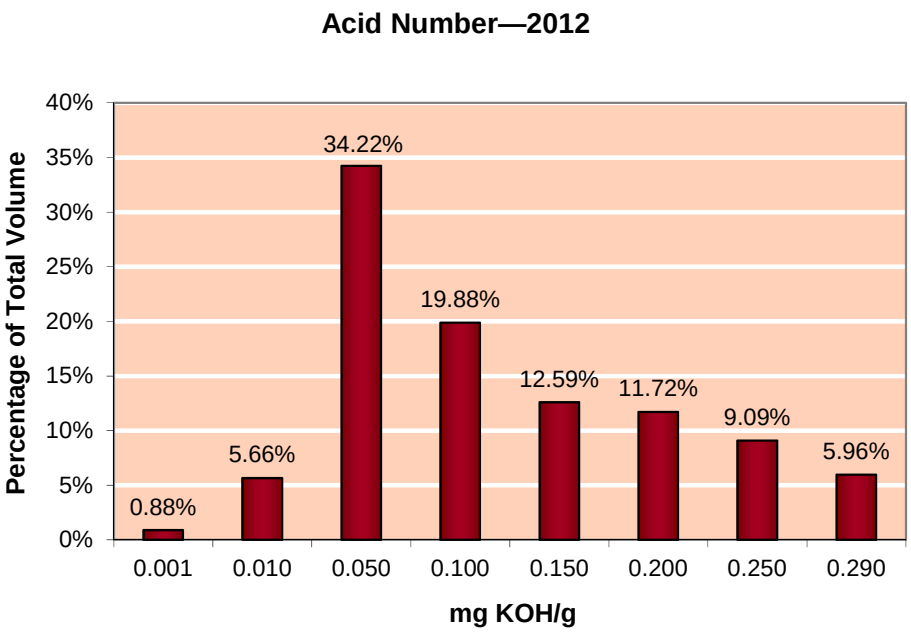


Figure 7-1: Acid Number (mg KOH/g), maximum 0.30

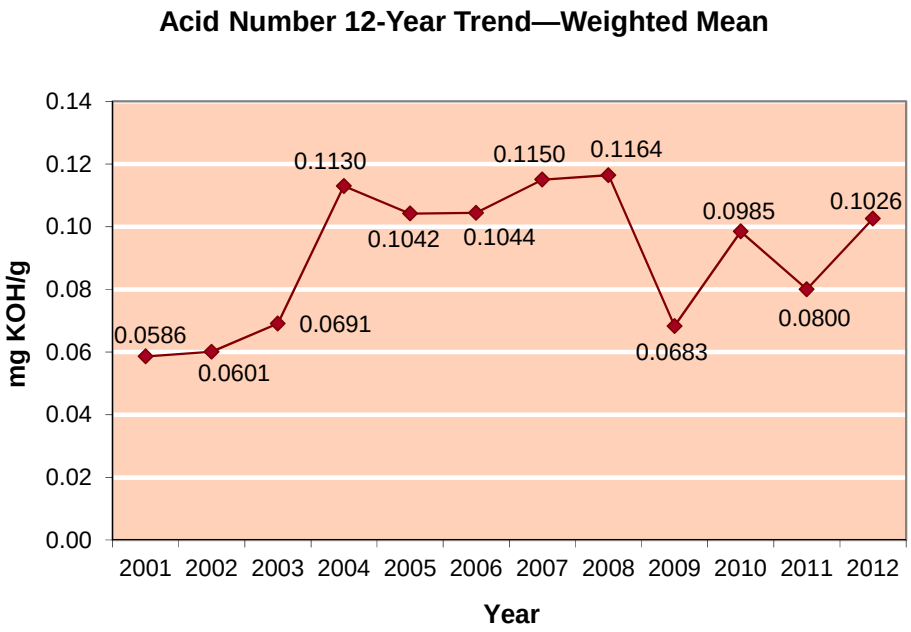


Figure 7-2: Acid Number (mg KOH/g), 12-Year Trend, maximum 0.30

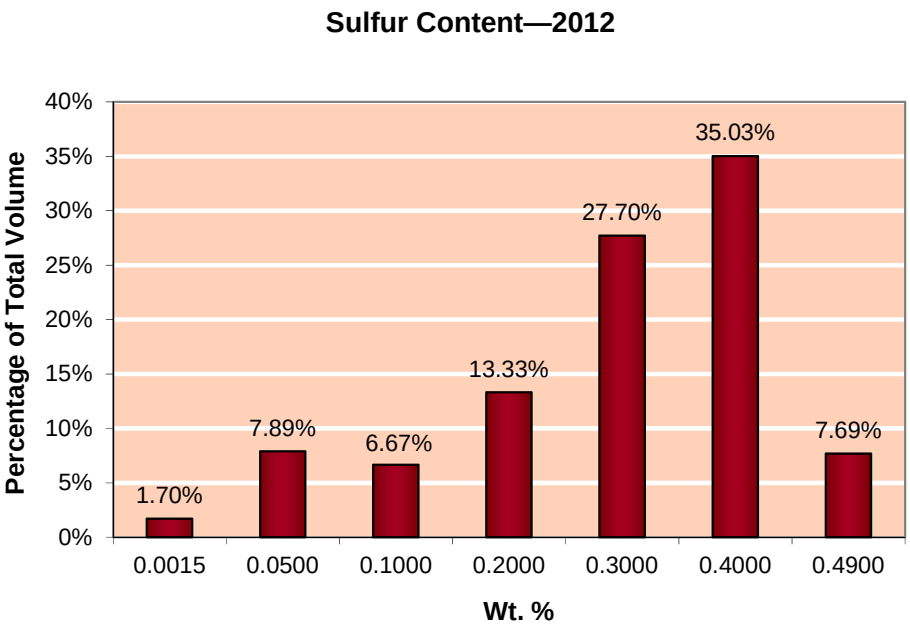


Figure 7-3: Sulfur Content (wt. %), maximum 0.5

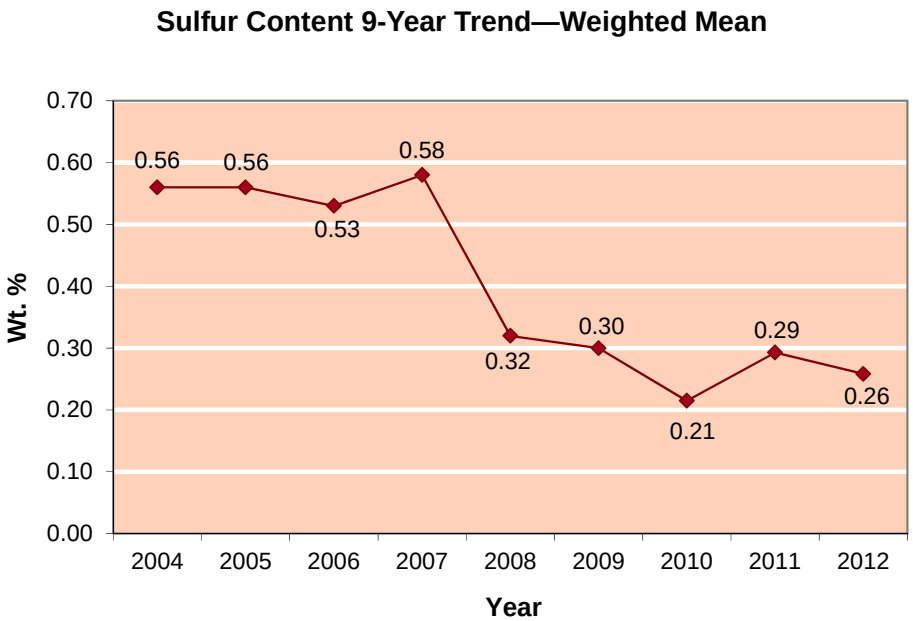


Figure 7-4: Sulfur Content (wt. %), 9-Year Trend, maximum 0.5

Note: The MIL-DTL-16884 Sulfur Content maximum limit was changed to 0.1 mass % in August 2012. Eighty-nine measurements exceeded this limit in 2012. No F76 measurements exceeded the previous maximum limit of 0.5 mass % in 2012.

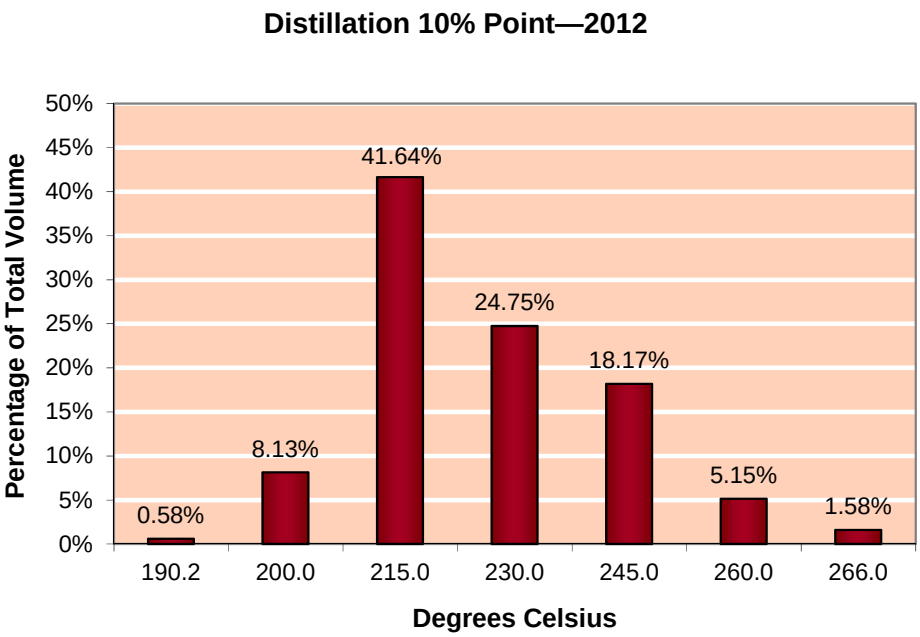


Figure 7-5: Distillation 10% Point (°C), Report

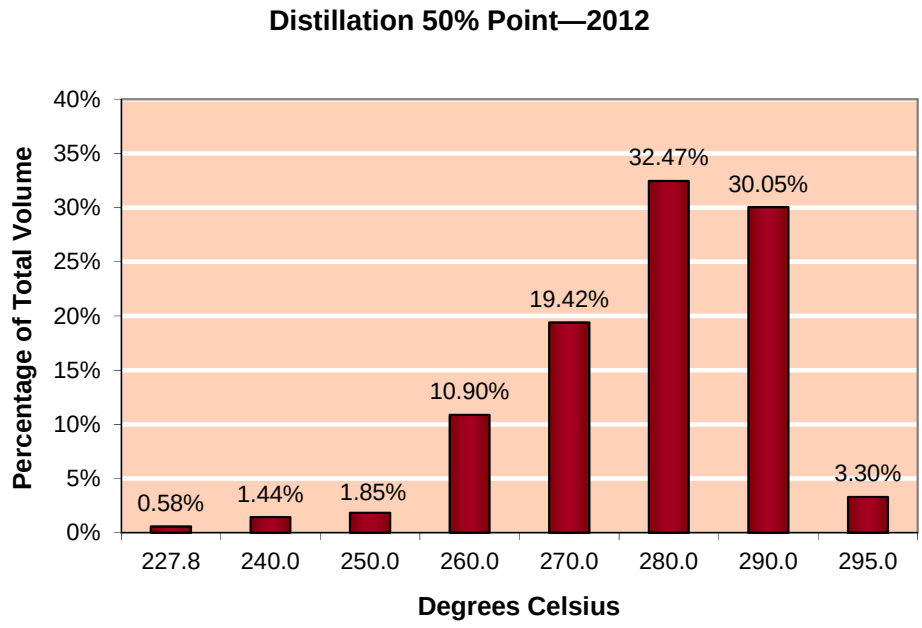


Figure 7-6: Distillation 50% Point (°C), Report

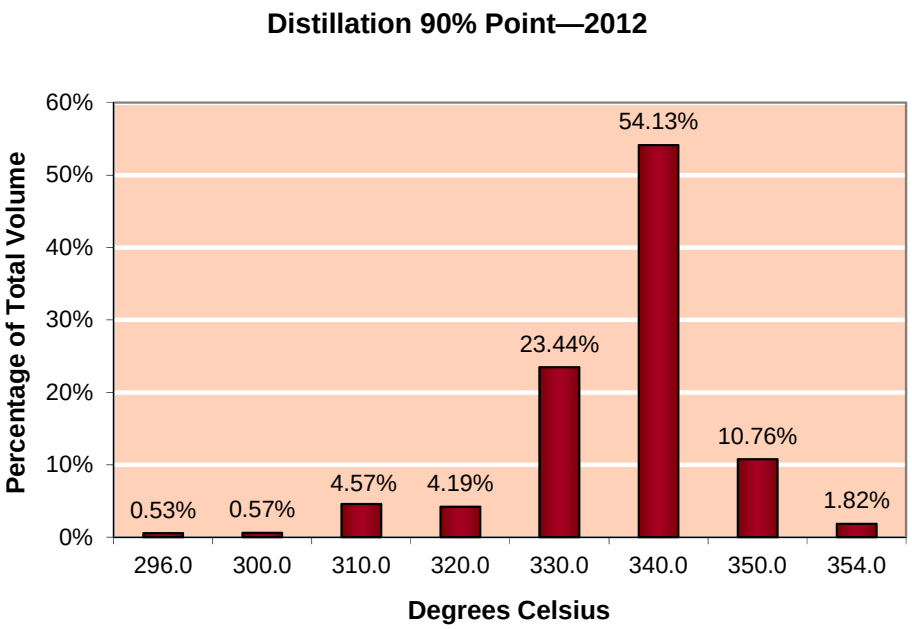


Figure 7-7: Distillation 90% Point (°C), maximum 357

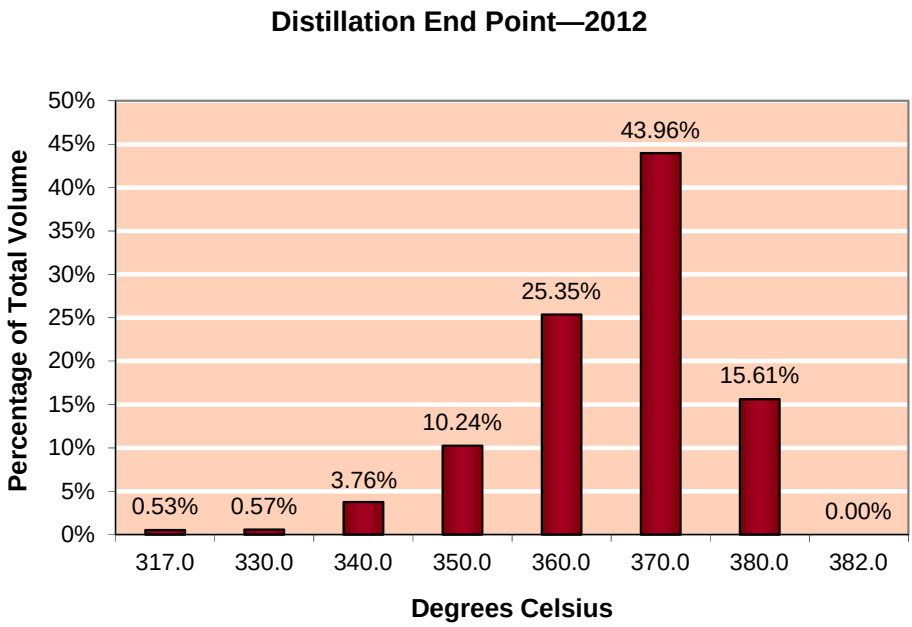


Figure 7-8: Distillation End Point (°C), maximum 385

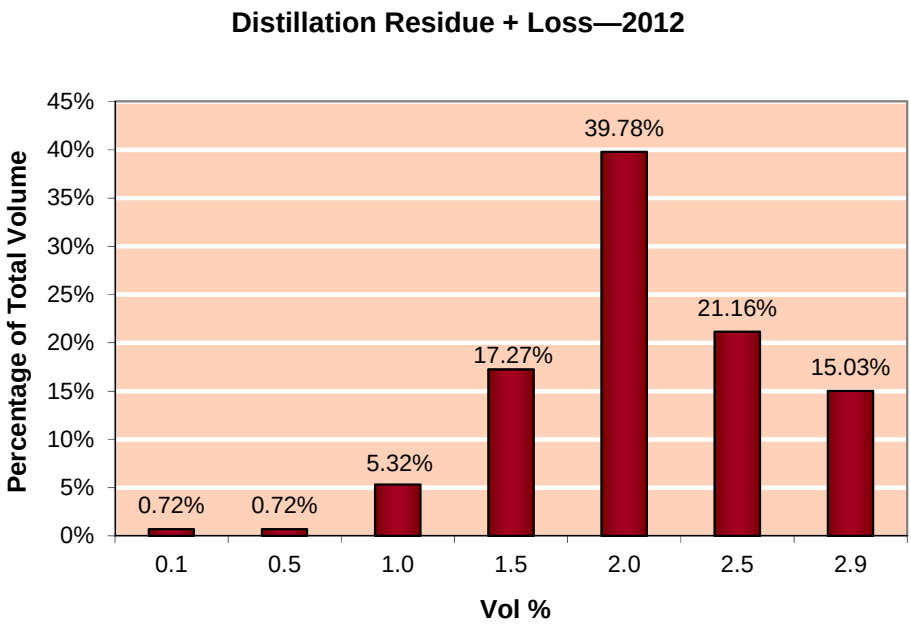


Figure 7-9: Distillation Residue + Loss (vol %), maximum 3.0

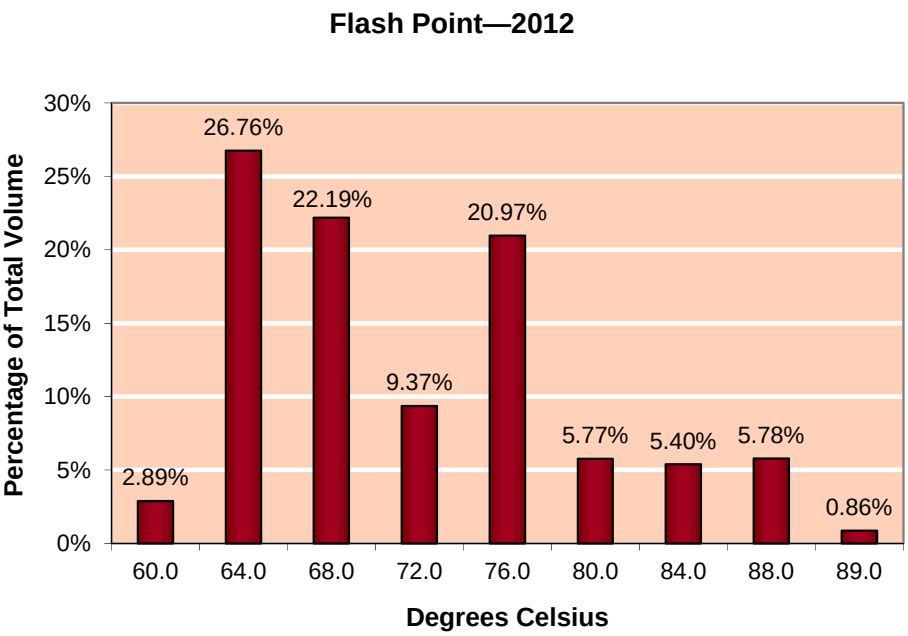


Figure 7-10: Flash Point (°C), minimum 60

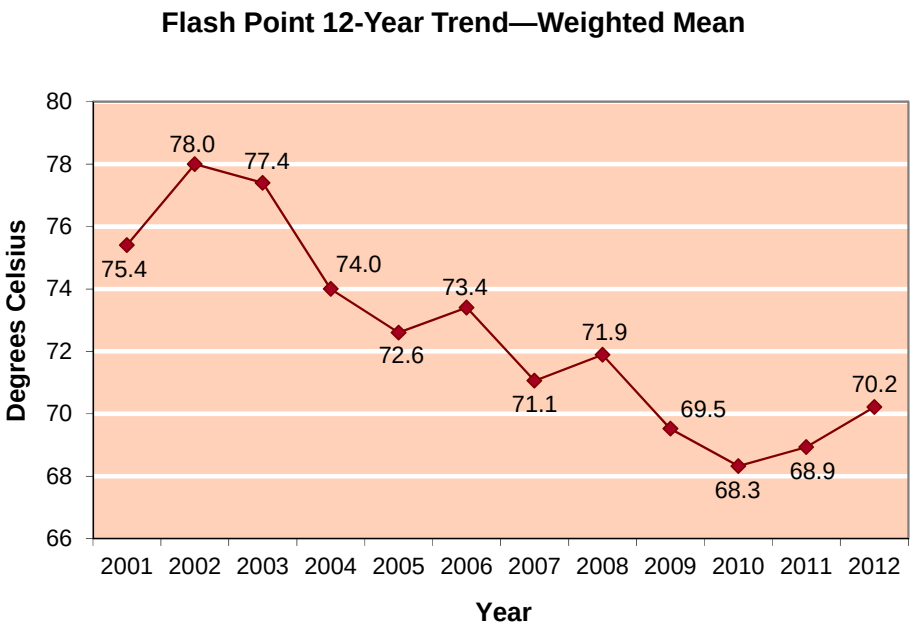


Figure 7-11: Flash Point (°C), 12-Year Trend, minimum 60

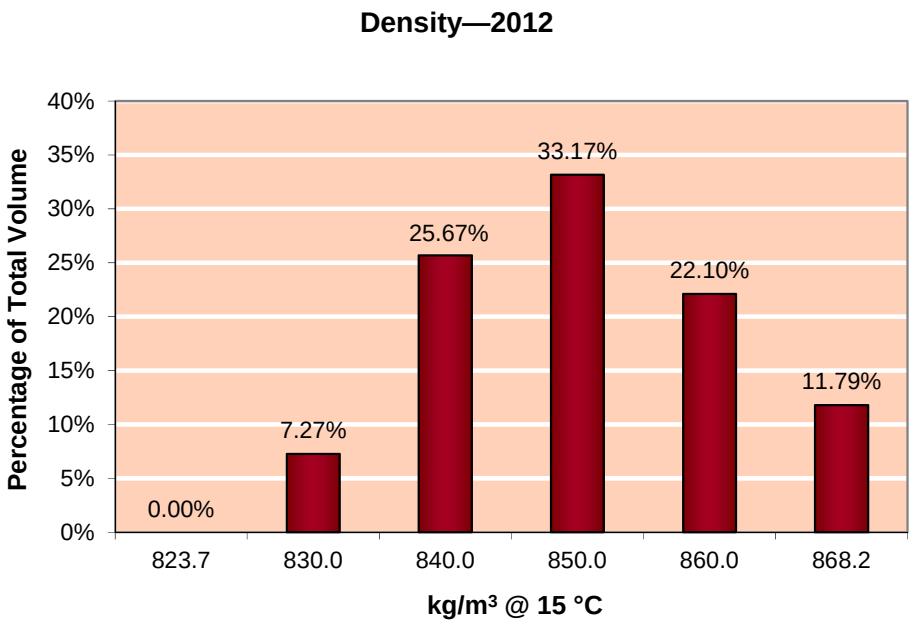


Figure 7-12: Density (kg/m^3 @ 15 °C), maximum 876

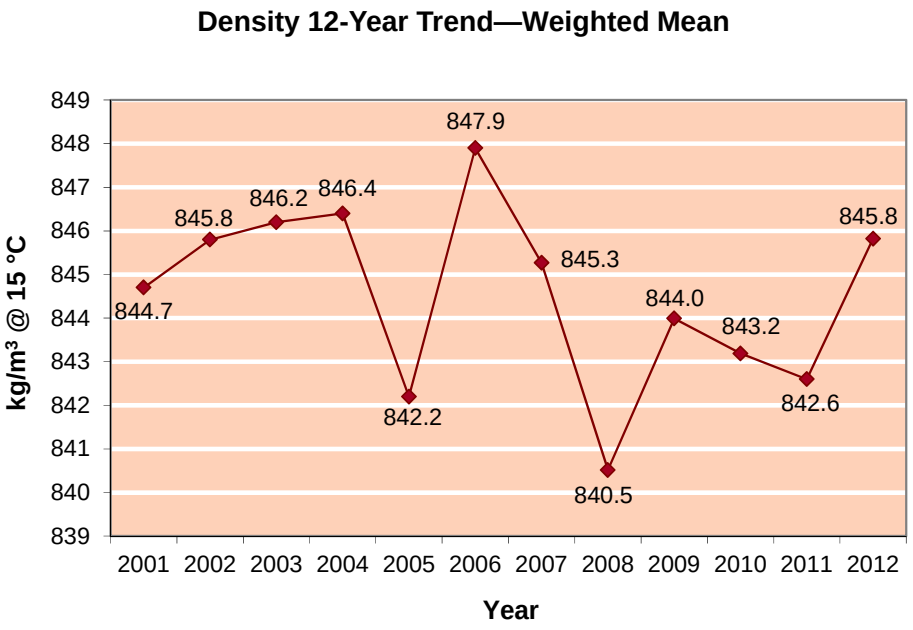


Figure 7-13: Density (kg/m^3 @ 15 °C), 12-Year Trend, maximum 876

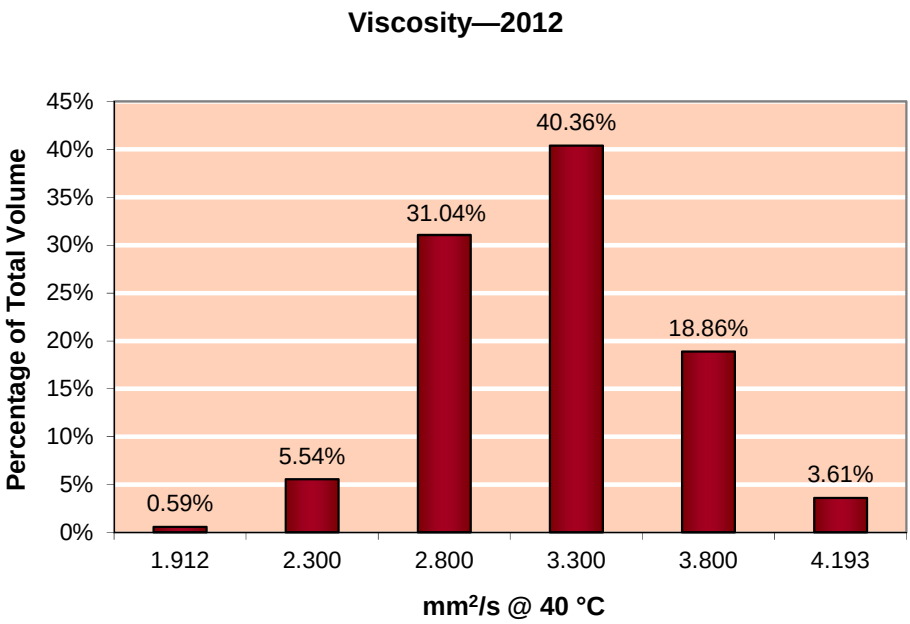


Figure 7-14: Viscosity (mm^2/s @ 40 °C), minimum 1.7, maximum 4.3

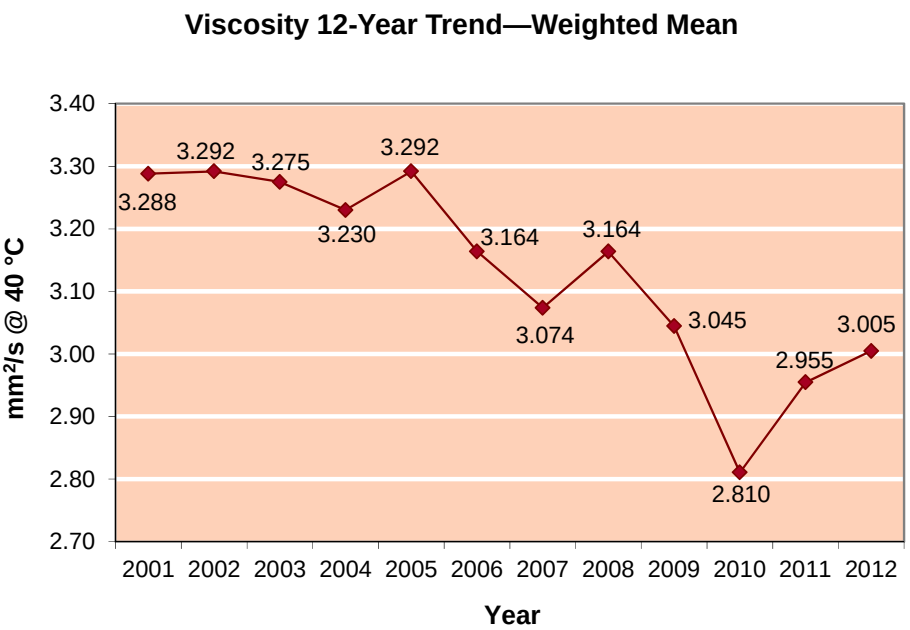


Figure 7-15: Viscosity (mm^2/s @ 40 °C), 12-Year Trend, minimum 1.7, maximum 4.3

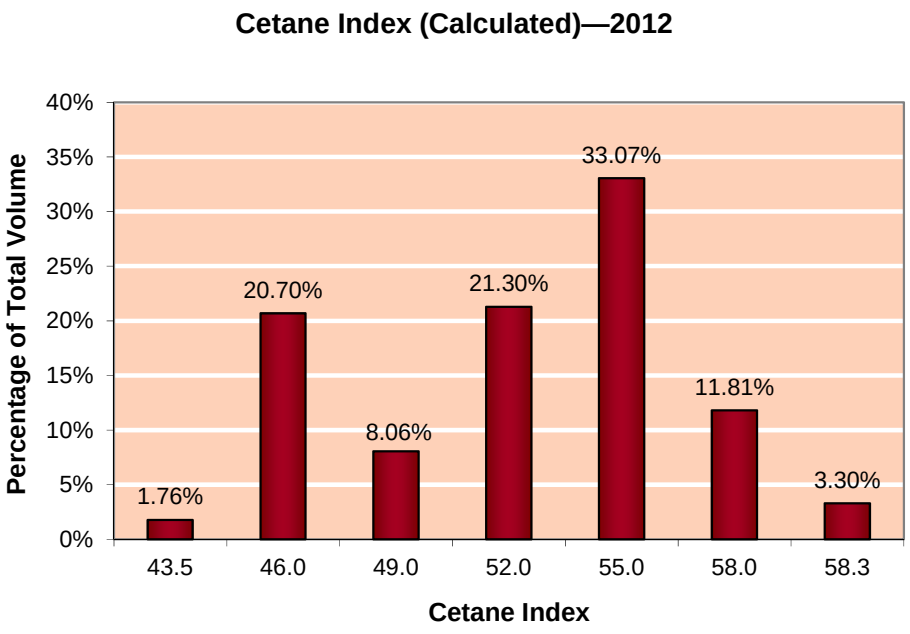


Figure 7-16: Cetane Index (Calculated), minimum 43

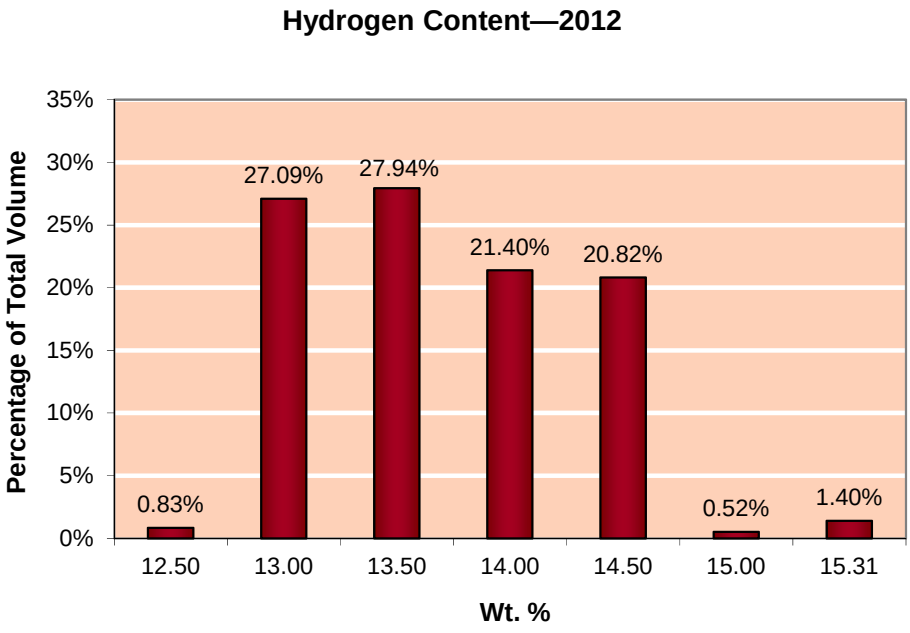


Figure 7-17: Hydrogen Content (wt. %), minimum 12.5

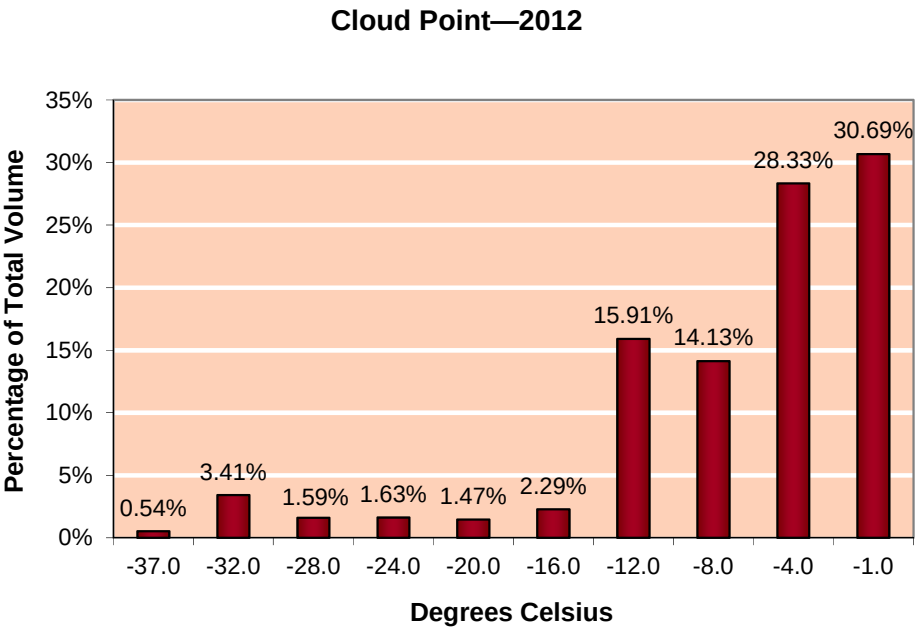


Figure 7-18: Cloud Point (°C), maximum –1

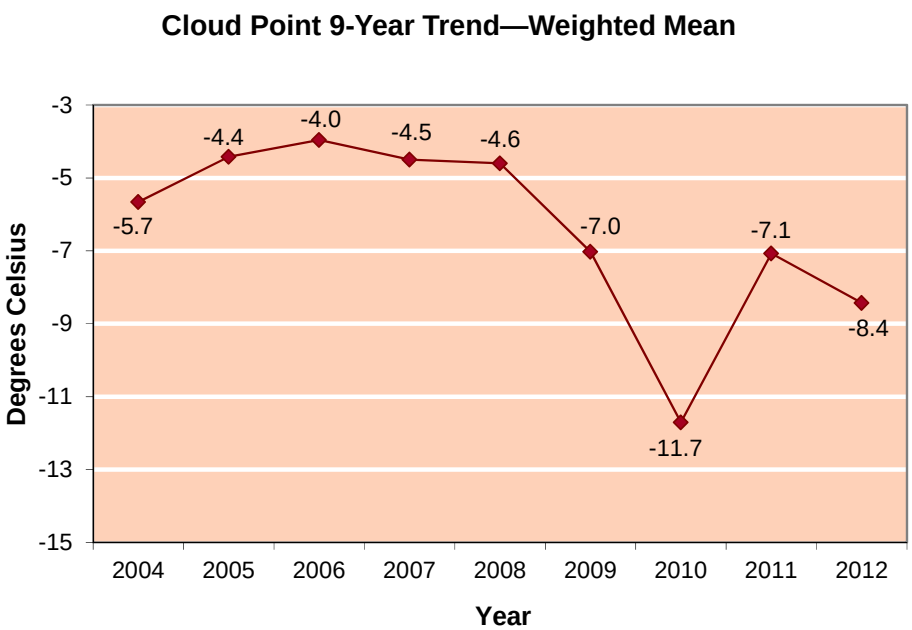


Figure 7-19: Cloud Point (°C), 9-Year Trend, maximum –1

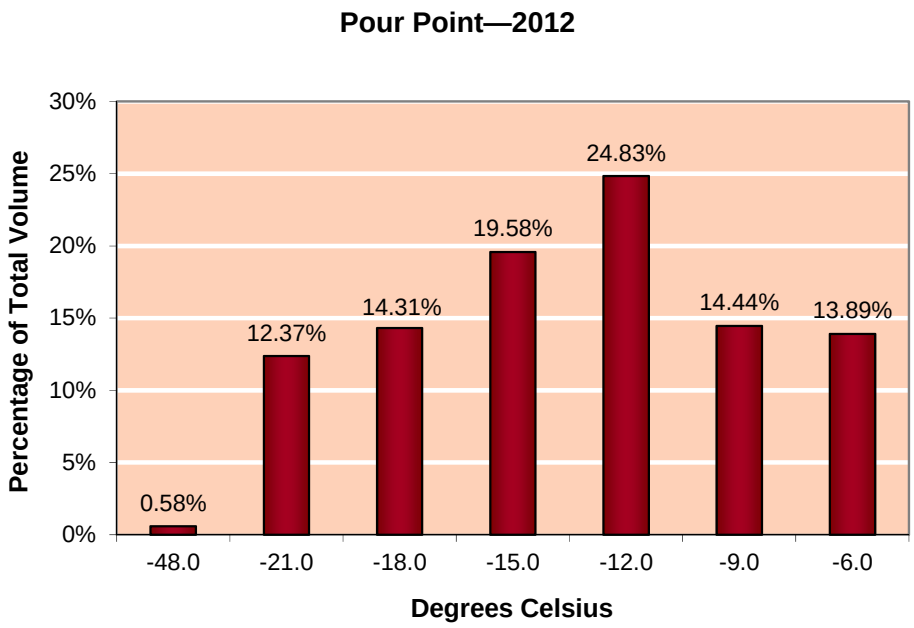


Figure 7-20: Pour Point (°C), maximum –6

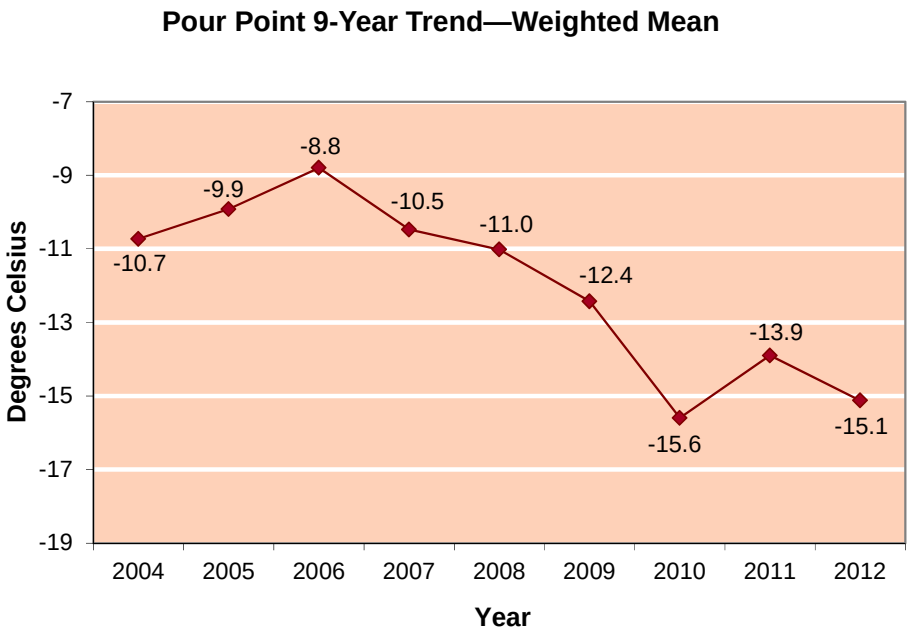


Figure 7-21: Pour Point (°C), 9-year Trend, maximum –6

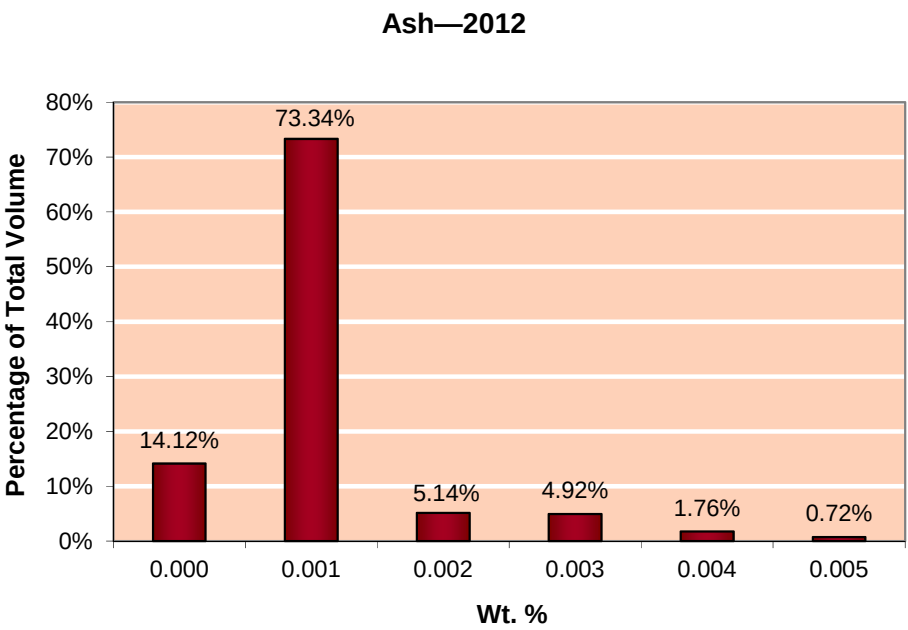


Figure 7-22: Ash (wt. %), maximum 0.005

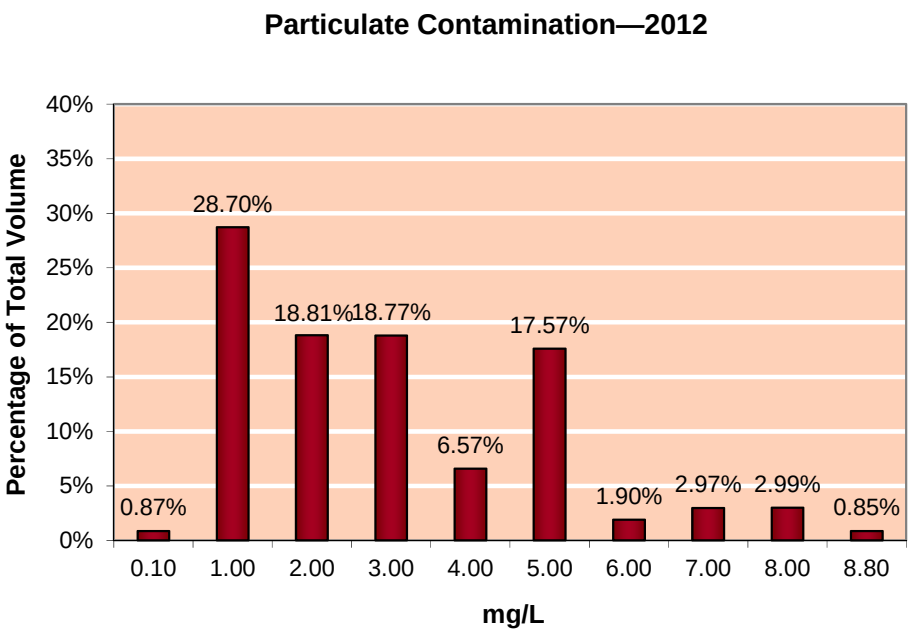


Figure 7-23: Particulate Contamination (mg/L), maximum 10

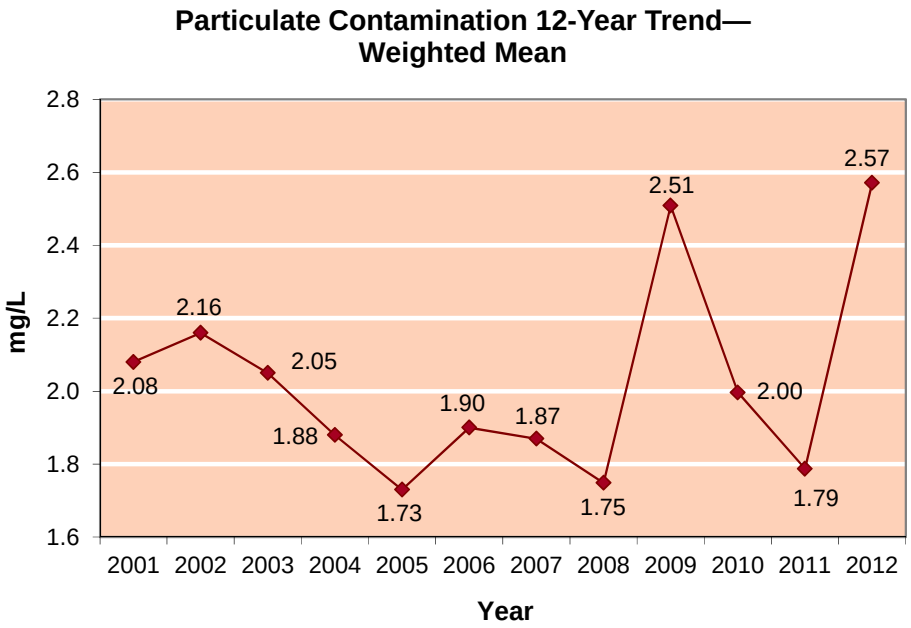


Figure 7-24: Particulate Contamination (mg/L), 12-Year Trend, maximum 10

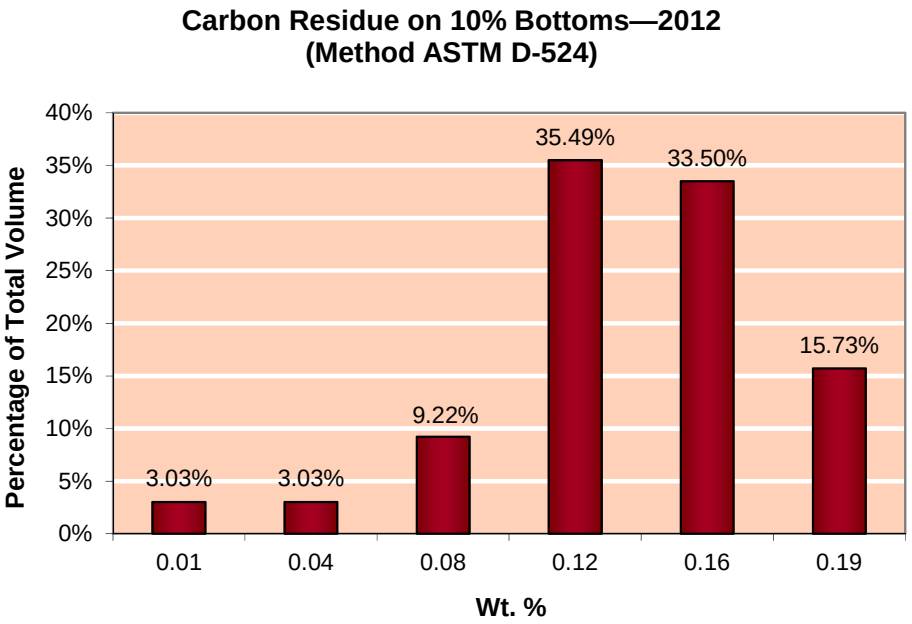


Figure 7-25: Carbon Residue on 10% Bottoms: D-524 (wt. %), maximum 0.20

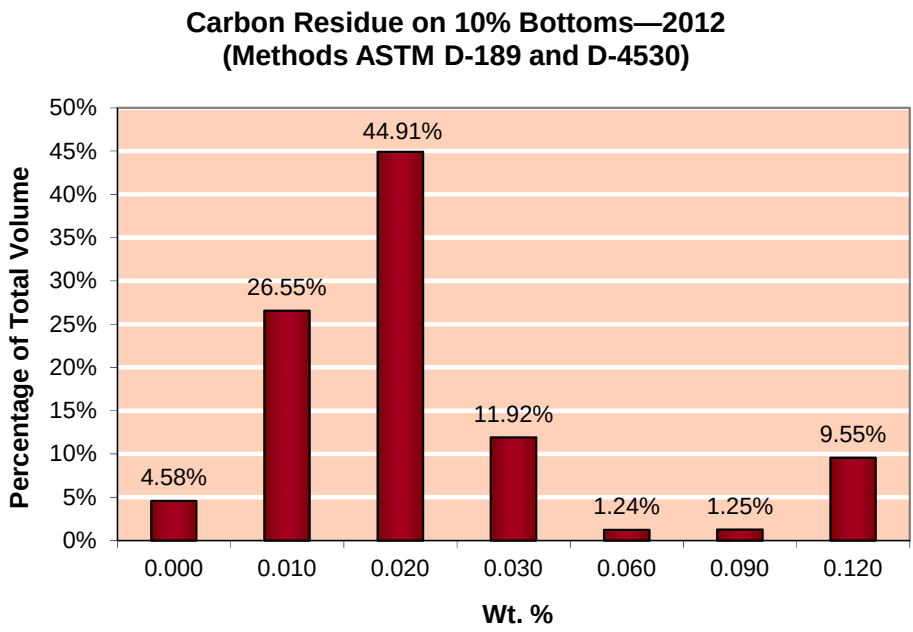


Figure 7-26: Carbon Residue on 10% Bottoms: D-189 and D-4530 (wt. %), maximum 0.14

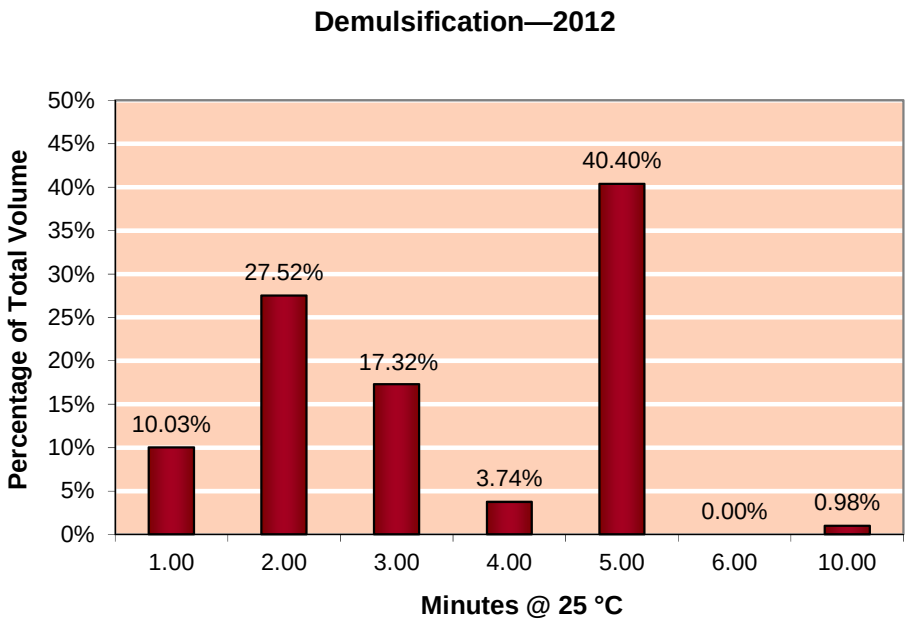


Figure 7-27: Demulsification (minutes @ 25 °C), maximum 10

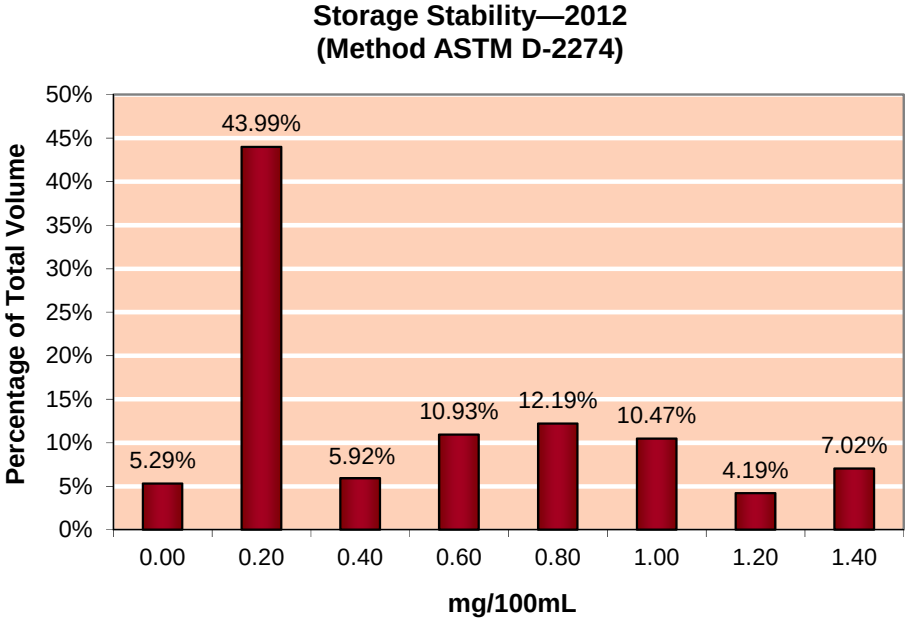


Figure 7-28: Storage Stability: D-2274 (mg/100 mL), maximum 1.5

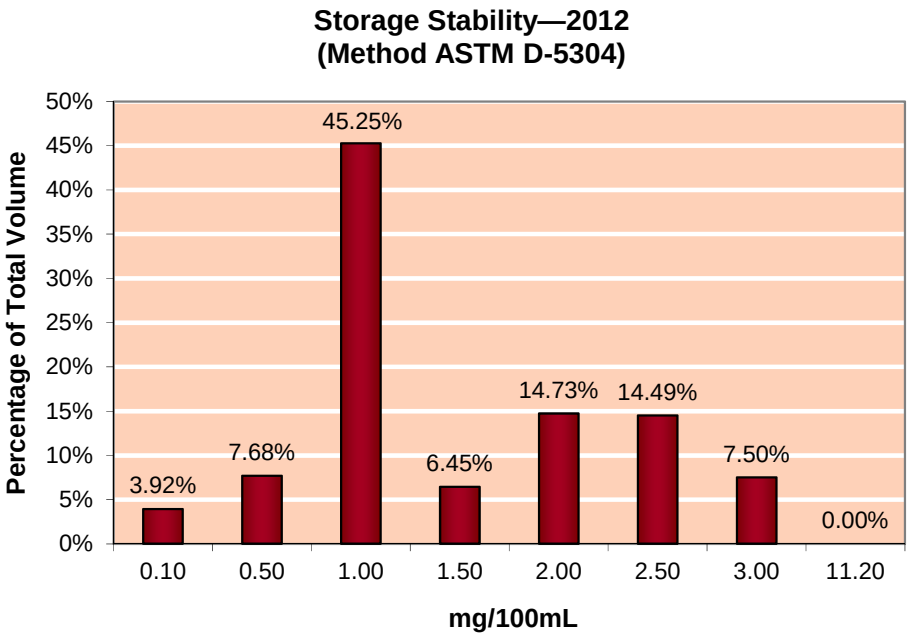


Figure 7-29: Storage Stability: D-5304 (mg/100 mL), maximum 3.0

8. MGO Data

8. MGO–2012 Data Summary

Commercial Marine Gas Oil Minimum Specification Requirements (ISO-8217, Marine Gas Oil, Grade DMA)			
Property	**2012 Source Inputs**		
	Region	**Volume**	**Batch**
Cetane Index: (calculated)	All	3.269	111
Flash Point: (°C)	All	3.269	111
Pour Point: (°C)	All	3.269	111
Kinematic Viscosity: (mm^2/s @ 40 °C)	All	3.269	111
Density: (kg/m^3 @ 15 °C)	All	3.269	111
Carbon Residue (10% Bottoms), D-4530: (mass %)	All	3.269	111
Ash: (mass%)	All	3.269	111
Sulfur: (mass %)	All	3.269	111
Acid Number: (mg KOH/g)	All	3.269	111
Oxidation Stability: (mg/100mL)	All	3.269	111
Lubricity, corrected wear scar diameter @ 60 °C: (µm)	All	3.269	111
FAME: (vol %)	All	3.269	111

Table 8-1: Data Summary, ISO-8217, Marine Gas Oil, Grade DMA Requirements, 2012 Source Inputs

Commercial Marine Gas Oil Minimum Specification Requirements (ISO-8217, Marine Gas Oil, Grade DMA)						
Property	**Specification Limits**		**2012 Test Results**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Cetane Index: (calculated)	**40**		40.1	56.6	48.2	49.3
Flash Point: (°C)	**60**		47.0	109.0	67.9	69.2
Pour Point:[1] (°C)		**–6, 0**	–21.0	0.0	–17.5	–16.8
Kinematic Viscosity: (mm^2/s @ 40 °C)	**2.000**	**6.000**	2.167	5.418	2.854	2.878
Density: (kg/m^3 @ 15 °C)		**890**	827.4	867.5	848.2	846.0
Carbon Residue (10% Bottoms), D-4530: (mass %)		**0.30**	0.010	0.200	0.0239	0.0230
Ash: (mass%)		**0.010**	0.000	0.004	0.0009	0.0009
Sulfur: (mass %)		**1.0**	0.00038	0.4660	0.083	0.081
Acid Number: (mg KOH/g)		**0.5**	0.010	0.150	0.102	0.103
Oxidation Stability: (mg/100mL)		**25**	0.0	6.4	0.98	1.18
Lubricity, corrected wear scar diameter @ 60 °C:[2] (µm)		**520**	180.0	610.0	394.7	386.1
FAME: (vol %)		**0.5**	0.01	3.48	0.15	0.12

Table 8-2: Data Summary, ISO-8217, Marine Gas Oil, Grade DMA Requirements, 2012 Test Results

Note 1: Pour Point winter quality maximum limit equals –6 °C, while the summer quality maximum limit equals 0 °C.
Note 2: Requirement is applicable to fuels with sulfur content below 0.050 mass %.

Commercial Marine Gas Oil Minimum Specification Requirements (ISO-8217, Marine Gas Oil, Grade DMA)						
Property	Total Volume		0.531			
	Batch Analysis		29			
	Specification Limits		Region 1			
	Min	Max	Min	Max	Mean	Wt Mean
Cetane Index: (calculated)	40		45.3	52.5	47.5	47.4
Flash Point: (°C)	60		47.0	68.0	62.5	61.6
Pour Point: (°C)		–6, 0	–21.0	–18.0	–20.8	–20.8
Kinematic Viscosity: (mm^2/s @ 40 °C)	2.000	6.000	2.327	3.251	2.581	2.563
Density: (kg/m^3 @ 15 °C)		890	827.4	862.0	846.7	846.7
Carbon Residue (10% Bottoms), D-4530: (mass %)		0.30	0.010	0.200	0.0297	0.0409
Ash: (mass%)		0.010	0.000	0.004	0.0013	0.0014
Sulfur: (mass %)		1.0	0.00059	0.3410	0.0216	0.0269
Acid Number: (mg KOH/g)		0.5	0.010	0.150	0.100	0.102
Oxidation Stability: (mg/100mL)		25	0.0	2.2	0.80	0.82
Lubricity, corrected wear scar diameter @ 60 °C: (µm)		520	195.0	590.0	375.2	372.3
FAME: (vol %)		0.5	0.01	3.48	0.37	0.44

Table 8-3: Region 1 Summary

Commercial Marine Gas Oil Minimum Specification Requirements (ISO-8217, Marine Gas Oil, Grade DMA)						
Property	Total Volume		0.278			
	Batch Analysis		14			
	Specification Limits		Region 2			
	Min	Max	Min	Max	Mean	Wt Mean
Cetane Index: (calculated)	40		42.7	46.4	44.8	45.1
Flash Point: (°C)	60		55.0	73.0	64.6	65.7
Pour Point: (°C)		–6, 0	–21.0	–21.0	–21.0	–21.0
Kinematic Viscosity: (mm^2/s @ 40 °C)	2.000	6.000	2.167	2.903	2.516	2.506
Density: (kg/m^3 @ 15 °C)		890	839.5	860.0	852.1	851.1
Carbon Residue (10% Bottoms), D-4530: (mass %)		0.30	0.010	0.040	0.0150	0.0124
Ash: (mass%)		0.010	0.000	0.001	0.0008	0.0007
Sulfur: (mass %)		1.0	0.00038	0.0239	0.0032	0.0041
Acid Number: (mg KOH/g)		0.5	0.100	0.100	0.100	0.100
Oxidation Stability: (mg/100mL)		25	0.2	1.5	0.49	0.48
Lubricity, corrected wear scar diameter @ 60 °C: (µm)		520	190.0	575.0	444.9	442.7
FAME: (vol %)		0.5	0.01	0.07	0.03	0.03

Table 8-4: Region 2 Summary

8. MGO—2012 Regional Data Summary

Commercial Marine Gas Oil Minimum Specification Requirements (ISO-8217, Marine Gas Oil, Grade DMA)						
Property	**Total Volume**		**0.033**			
	Batch Analysis		**2**			
	Specification Limits		**Region 3**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Cetane Index: (calculated)	**40**		46.7	47.0	46.9	46.8
Flash Point: (°C)	**60**		65.0	67.0	66.0	66.1
Pour Point: (°C)		**–6, 0**	–21.0	–21.0	–21.0	–21.0
Kinematic Viscosity: (mm^2/s @ 40 °C)	**2.000**	**6.000**	2.680	2.730	2.705	2.708
Density: (kg/m^3 @ 15 °C)		**890**	849.9	850.4	850.2	850.1
Carbon Residue (10% Bottoms), D-4530: (mass %)		**0.30**	0.060	0.130	0.0950	0.0914
Ash: (mass%)		**0.010**	0.001	0.004	0.0025	0.0023
Sulfur: (mass %)		**1.0**	0.0010	0.0018	0.0014	0.0014
Acid Number: (mg KOH/g)		**0.5**	0.100	0.100	0.100	0.100
Oxidation Stability: (mg/100mL)		**25**	0.1	0.3	0.20	0.21
Lubricity, corrected wear scar diameter @ 60 °C: (µm)		**520**	440.0	520.0	480.0	475.8
FAME: (vol %)		**0.5**	0.08	0.11	0.10	0.10

Table 8-5: Region 3 Summary

Commercial Marine Gas Oil Minimum Specification Requirements (ISO-8217, Marine Gas Oil, Grade DMA)						
Property	**Total Volume**		**0.344**			
	Batch Analysis		**6**			
	Specification Limits		**Region 5**			
	Min	**Max**	**Min**	**Max**	**Mean**	**Wt Mean**
Cetane Index: (calculated)	**40**		40.1	55.2	48.0	49.0
Flash Point: (°C)	**60**		63.0	70.0	67.3	65.9
Pour Point: (°C)		**–6, 0**	–21.0	–15.0	–19.0	–18.6
Kinematic Viscosity: (mm^2/s @ 40 °C)	**2.000**	**6.000**	2.194	2.887	2.534	2.539
Density: (kg/m^3 @ 15 °C)		**890**	829.2	859.6	844.6	841.9
Carbon Residue (10% Bottoms), D-4530: (mass %)		**0.30**	0.010	0.050	0.0183	0.0146
Ash: (mass%)		**0.010**	0.000	0.001	0.0008	0.0007
Sulfur: (mass %)		**1.0**	0.00091	0.0156	0.0049	0.0031
Acid Number: (mg KOH/g)		**0.5**	0.100	0.100	0.100	0.100
Oxidation Stability: (mg/100mL)		**25**	0.2	1.4	0.60	0.60
Lubricity, corrected wear scar diameter @ 60 °C: (µm)		**520**	290.0	540.0	419.2	430.1
FAME: (vol %)		**0.5**	0.01	0.05	0.02	0.02

Table 8-6: Region 5 Summary

Commercial Marine Gas Oil Minimum Specification Requirements (ISO-8217, Marine Gas Oil, Grade DMA)						
Property	Total Volume		0.690			
	Batch Analysis		11			
	Specification Limits		Region 8			
	Min	Max	Min	Max	Mean	Wt Mean
Cetane Index: (calculated)	**40**		50.1	56.6	51.4	52.0
Flash Point: (°C)	**60**		61.0	109.0	84.5	78.3
Pour Point: (°C)		**–6, 0**	–21.0	–18.0	–20.7	–20.5
Kinematic Viscosity: (mm^2/s @ 40 °C)	**2.000**	**6.000**	2.451	3.687	3.025	2.872
Density: (kg/m^3 @ 15 °C)		**890**	829.0	849.2	842.4	839.9
Carbon Residue (10% Bottoms), D-4530: (mass %)		**0.30**	0.010	0.020	0.0109	0.0106
Ash: (mass%)		**0.010**	0.000	0.002	0.0007	0.0006
Sulfur: (mass %)		**1.0**	0.00065	0.0054	0.0013	0.0014
Acid Number: (mg KOH/g)		**0.5**	0.100	0.110	0.101	0.100
Oxidation Stability: (mg/100mL)		**25**	0.0	1.0	0.41	0.38
Lubricity, corrected wear scar diameter @ 60 °C: (µm)		**520**	200.0	610.0	375.9	341.8
FAME: (vol %)		**0.5**	0.01	0.05	0.04	0.04

Table 8-7: Region 8 Summary

Commercial Marine Gas Oil Minimum Specification Requirements (ISO-8217, Marine Gas Oil, Grade DMA)						
Property	Total Volume		0.223			
	Batch Analysis		13			
	Specification Limits		Region 9			
	Min	Max	Min	Max	Mean	Wt Mean
Cetane Index: (calculated)	**40**		44.5	55.3	48.3	51.6
Flash Point: (°C)	**60**		52.0	84.0	65.8	74.5
Pour Point: (°C)		**–6, 0**	–21.0	–3.0	–18.5	–11.0
Kinematic Viscosity: (mm^2/s @ 40 °C)	**2.000**	**6.000**	2.322	4.048	2.806	3.393
Density: (kg/m^3 @ 15 °C)		**890**	840.5	858.0	847.2	845.0
Carbon Residue (10% Bottoms), D-4530: (mass %)		**0.30**	0.010	0.040	0.0146	0.0132
Ash: (mass%)		**0.010**	0.000	0.001	0.0005	0.0008
Sulfur: (mass %)		**1.0**	0.0006	0.4020	0.0606	0.1143
Acid Number: (mg KOH/g)		**0.5**	0.100	0.100	0.100	0.100
Oxidation Stability: (mg/100mL)		**25**	0.2	6.4	1.22	3.55
Lubricity, corrected wear scar diameter @ 60 °C: (µm)		**520**	240.0	610.0	433.2	422.9
FAME: (vol %)		**0.5**	0.01	2.31	0.24	0.28

Table 8-8: Region 9 Summary

8. MGO—2012 Regional Data Summary

Commercial Marine Gas Oil Minimum Specification Requirements (ISO-8217, Marine Gas Oil, Grade DMA)						
Property	Total Volume		1.169			
	Batch Analysis		36			
	Specification Limits		Region 10			
	Min	Max	Min	Max	Mean	Wt Mean
Cetane Index: (calculated)	**40**		45.2	56.4	49.4	49.3
Flash Point: (°C)	**60**		57.0	80.0	69.3	68.2
Pour Point: (°C)		**–6, 0**	–21.0	0.0	–11.8	–12.4
Kinematic Viscosity: (mm^2/s @ 40 °C)	**2.000**	**6.000**	2.322	5.418	3.231	3.118
Density: (kg/m^3 @ 15 °C)		**890**	827.5	867.5	850.7	849.2
Carbon Residue (10% Bottoms), D-4530: (mass %)		**0.30**	0.010	0.080	0.0269	0.0272
Ash: (mass%)		**0.010**	0.000	0.003	0.0009	0.0009
Sulfur: (mass %)		**1.0**	0.0158	0.4660	0.2127	0.1892
Acid Number: (mg KOH/g)		**0.5**	0.100	0.150	0.105	0.106
Oxidation Stability: (mg/100mL)		**25**	0.1	5.1	1.52	1.74
Lubricity, corrected wear scar diameter @ 60 °C: (µm)		**520**	180.0	600.0	373.9	382.4
FAME: (vol %)		**0.5**	0.01	0.24	0.04	0.03

Table 8-9: Region 10 Summary

8. MGO—Assessment Summary

Overview:

MGO is continued for 2012, providing a detailed summary of test data by region. Histograms are provided for 2012 data only and were obtained solely from the PQIS database. Where significant trends were noted in weighted mean values, trend graphs were developed, providing a previous 12-year review.

The Coast Guard In-Line Sampling Program data represent dockside and vessel sampling for Ships' Bunkers program deliveries and open market purchases of MGO from various worldwide locations. Data provided were compared with ISO-8217 Grade DMA requirements and MIL-DTL-16884 criteria. The In-Line Sampling Program figures featured are based on these correlations and represent total analysis by year and the range of test failure occurrences for Calendar Year (CY) 2012 compared with these standards.

Significant Trending:

Cetane Index (calculated). The weighted mean increased 2.0 from 2007 to 2012.

Density. The weighted mean decreased 8.3 kg/m^3 @ 15 °C from 2007 to 2012.

Sulfur. The weighted mean increased 0.025 mass % from 2011 to 2012. However, despite increases from 2009 to 2010 and from 2011 to 2012, the weighted mean has decreased 0.203 mass % since 2006.

MGO Observations:

The following review applies only to In-Line Sampling Program activity critical test failure occurrences compared with ISO-8217 Grade DMA requirements and any additional Commercial Marine Gas Oil Minimum Specification requirements:

Cetane Index. Zero failure occurrences were noted during CY 2012. This represents a 0.0 percent failure rate on the basis of the 111 samples tested.

Flash Point. Nine failure occurrences were noted during CY 2012. This represents an 8.1 percent failure rate on the basis of the 111 samples tested.

8. MGO—Assessment Summary

Pour Point. Zero failure occurrences were noted during CY 2012. This represents a 0.0 percent failure rate on the basis of the 111 samples tested.

Kinematic Viscosity. Zero failure occurrences were noted during CY 2012. This represents a 0.0 percent failure rate on the basis of the 111 samples tested.

Density. Zero failure occurrences were noted during CY 2012. This represents a 0.0 percent failure rate on the basis of the 111 samples tested.

Carbon Residue, 10% btm (ASTM D4530). Zero failure occurrences were noted during CY 2012. This represents a 0.0 percent failure rate on the basis of the 111 samples tested.

Ash. Zero failure occurrences were noted during CY 2012. This represents a 0.0 percent failure rate on the basis of the 111 samples tested.

Sulfur. Zero failure occurrences were noted during CY 2012. This represents a 0.0 percent failure rate on the basis of the 111 samples tested.

Acid Number. Zero failure occurrences were noted during CY 2012. This represents a 0.0 percent failure rate on the basis of the 111 samples tested.

Appearance. Six failure occurrences were noted during CY 2012. This represents a 5.4 percent failure rate on the basis of the 111 samples tested.

Oxidation Stability. Zero failure occurrences were noted during CY 2012. This represents a 0.0 percent failure rate on the basis of the 111 samples tested.

Lubricity. Twelve failure occurrences were noted during CY 2012. This represents a 10.8 percent failure rate on the basis of the 111 samples tested.

Fatty Acid Methyl Esthers (FAME). Five failure occurrences were noted during CY 2012. This represents a 4.5 percent failure rate on the basis of the 111 samples tested.

The ISO-8217 Grade DMA requirements specify a 1.5 mass % maximum limit for sulfur and a 0.1 vol % maximum limit for FAME. Per Commercial Marine Gas Oil Minimum Specification Requirements (DLA Energy, October 2010), the maximum limit for sulfur is 1.0 mass %. For FAME, the DLA Energy MGO clause has raised the maximum allowable contamination to 0.5 vol % as a result of a Navy test program.

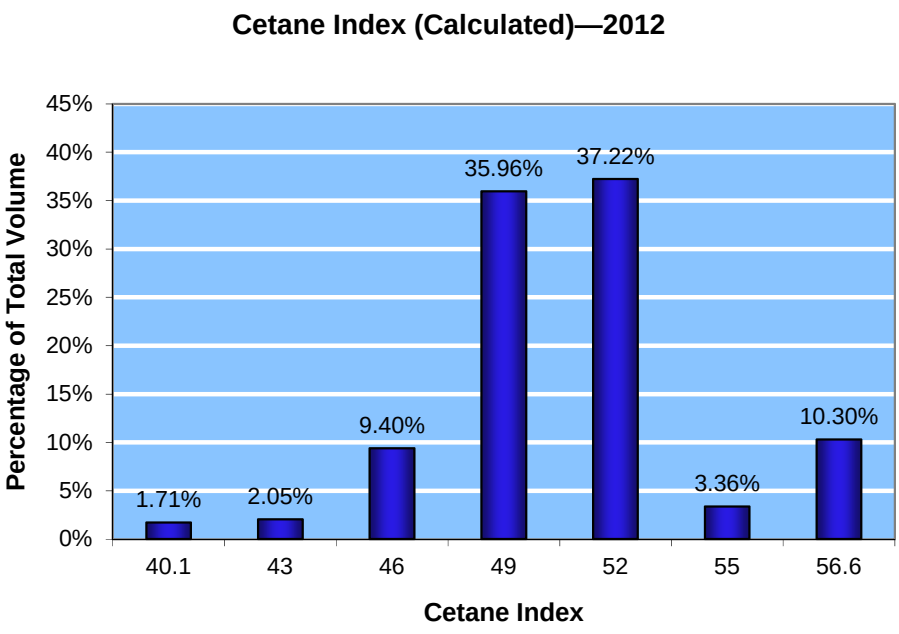


Figure 8-1: Cetane Index (calculated), minimum 40

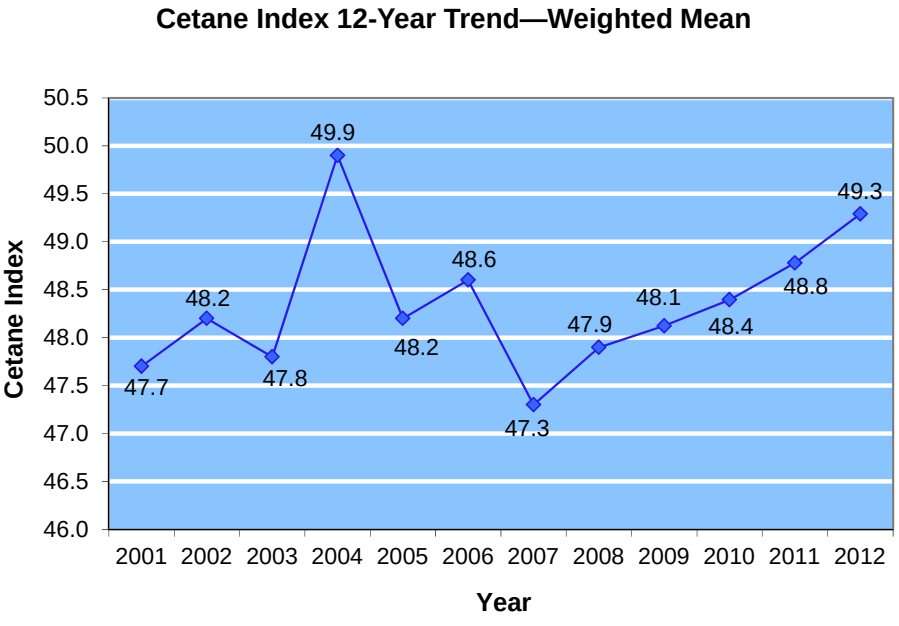


Figure 8-2: Cetane Index (calculated), 12-Year Trend, minimum 40

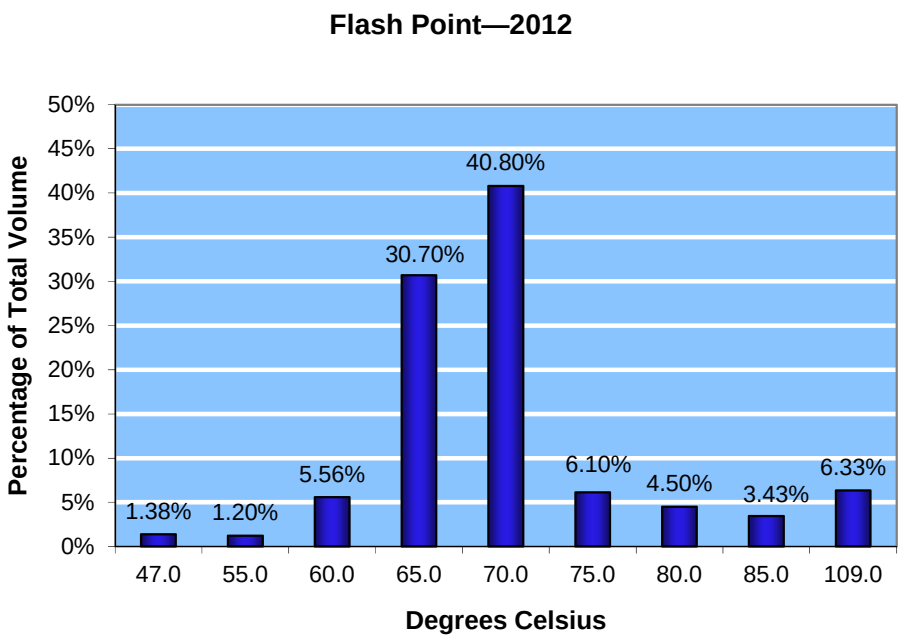


Figure 8-3: Flash Point (°C), minimum 60

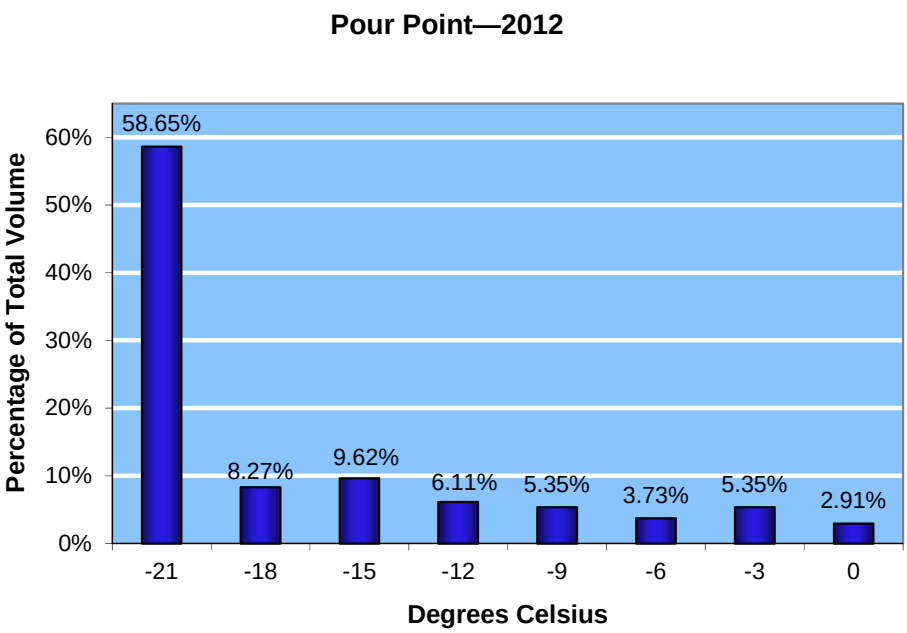


Figure 8-4: Pour Point (°C), maximum –6 (winter quality) or 0 (summer quality)

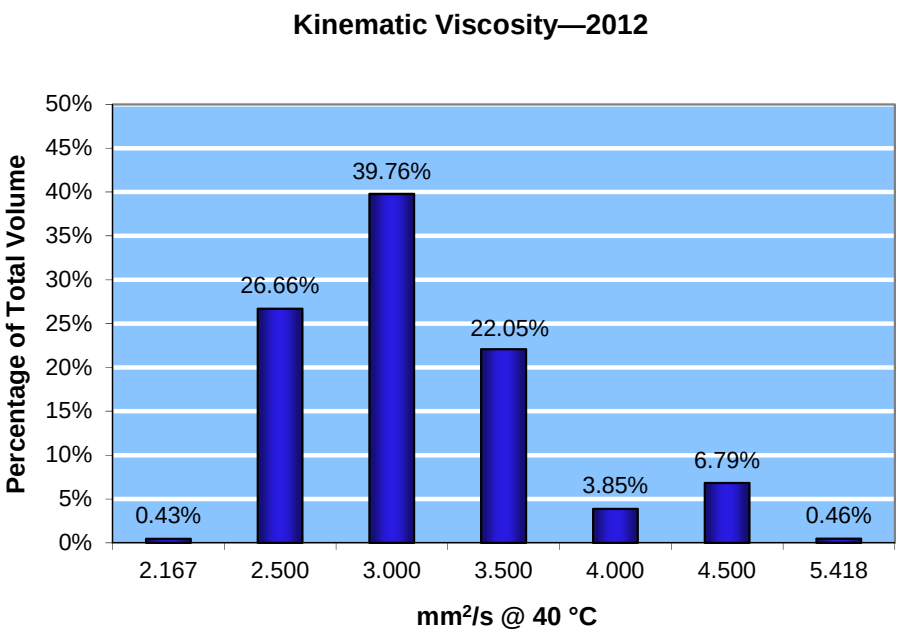


Figure 8-5: Kinematic Viscosity (mm^2/s @ 40 °C), minimum 2.000, maximum 6.000

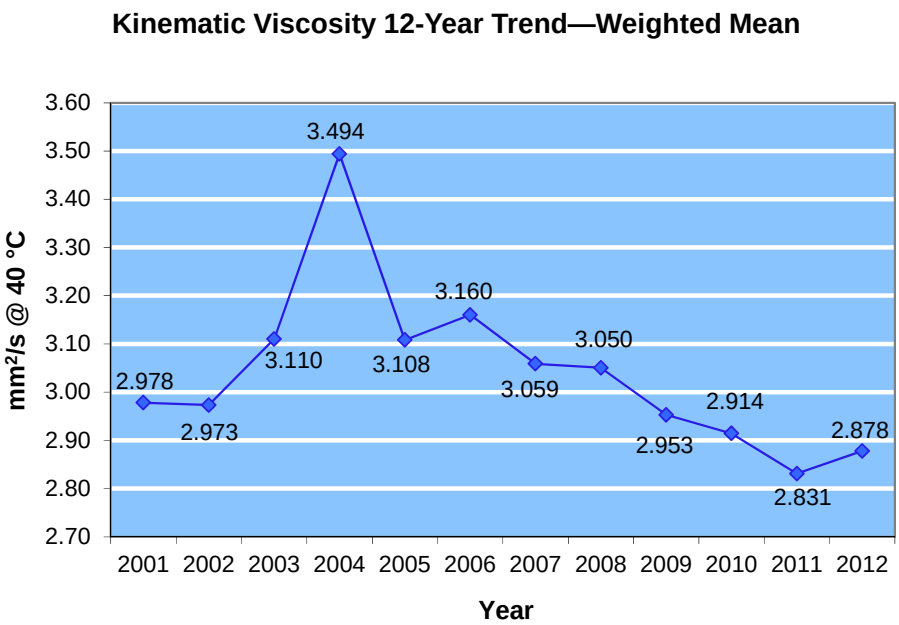


Figure 8-6: Kinematic Viscosity (mm^2/s @ 40 °C), 12-Year Trend, minimum 2.000, maximum 6.000

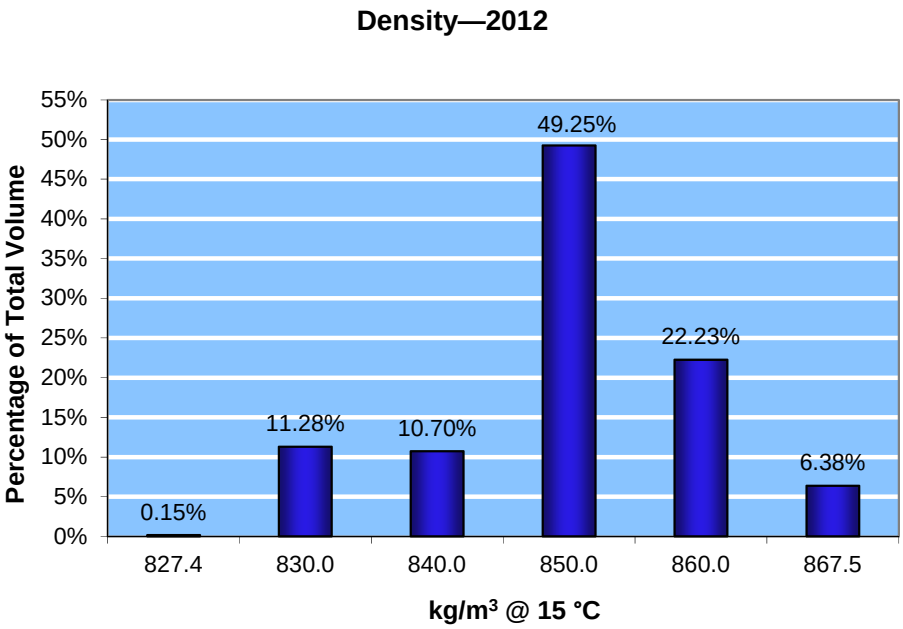


Figure 8-7: Density (kg/m^3 @ 15 °C), maximum 890

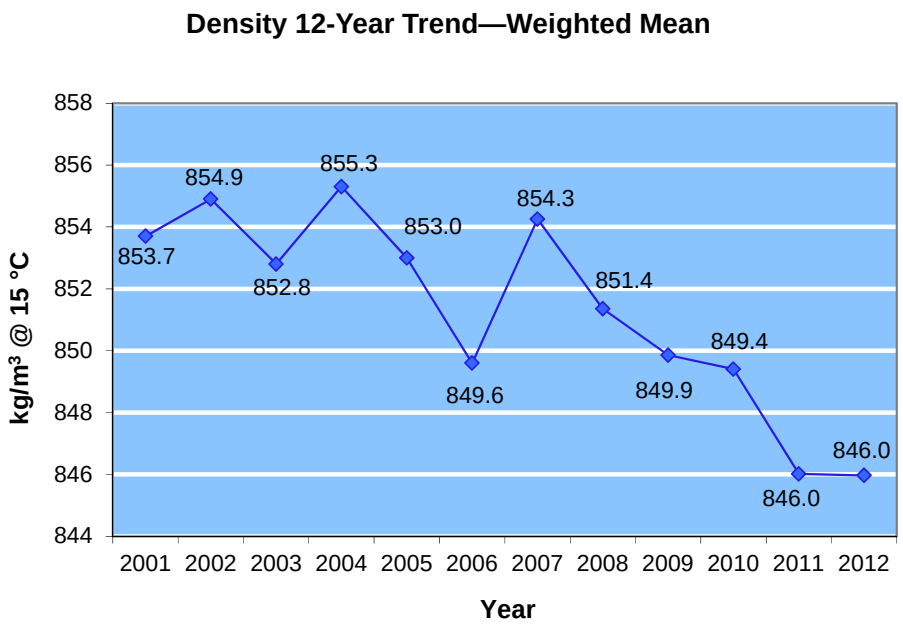


Figure 8-8: Density (kg/m^3 @ 15 °C), 12-Year Trend, maximum 890

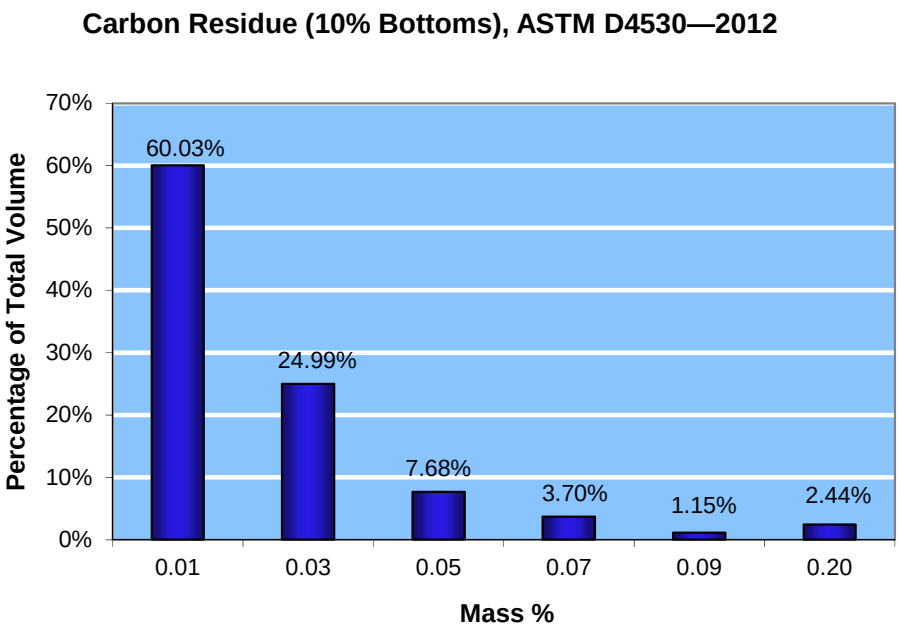


Figure 8-9: Carbon Residue (10% Bottoms), D-4530 (mass %), maximum 0.30

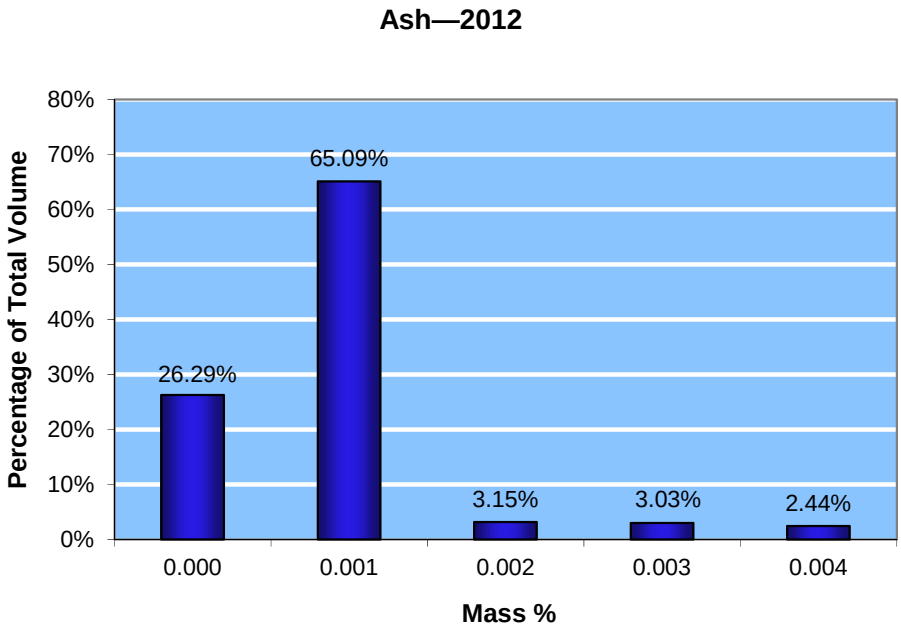


Figure 8-10: Ash (mass %), maximum 0.010

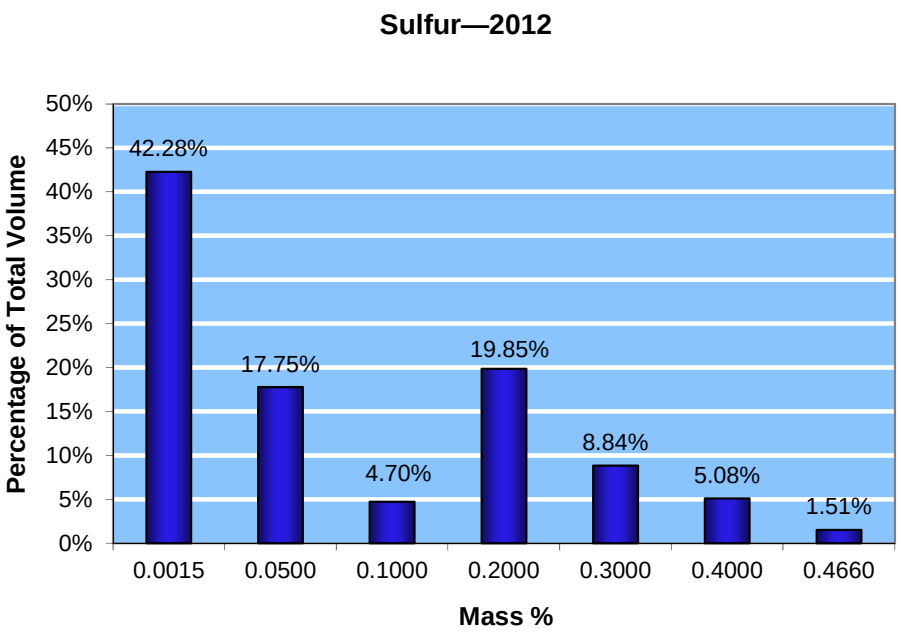


Figure 8-11: Sulfur (mass %), maximum 1.0

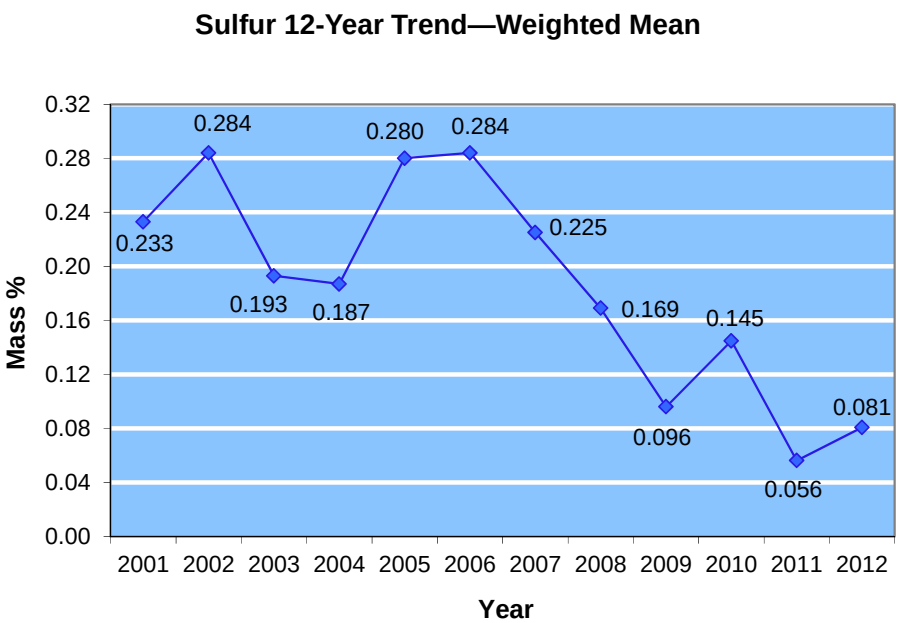


Figure 8-12: Sulfur (mass %), 12-Year Trend, maximum 1.0

Note: Per Commercial Marine Gas Oil Minimum Specification Requirements (DLA Energy, October 2010), the Sulfur maximum limit is 1.0 mass %.

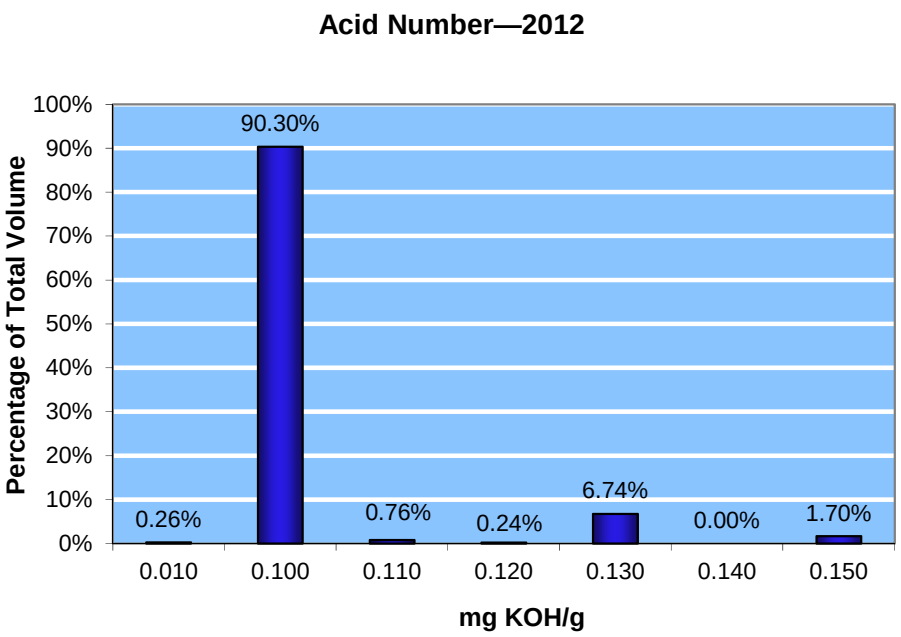


Figure 8-13: Acid Number (mg KOH/g), maximum 0.5

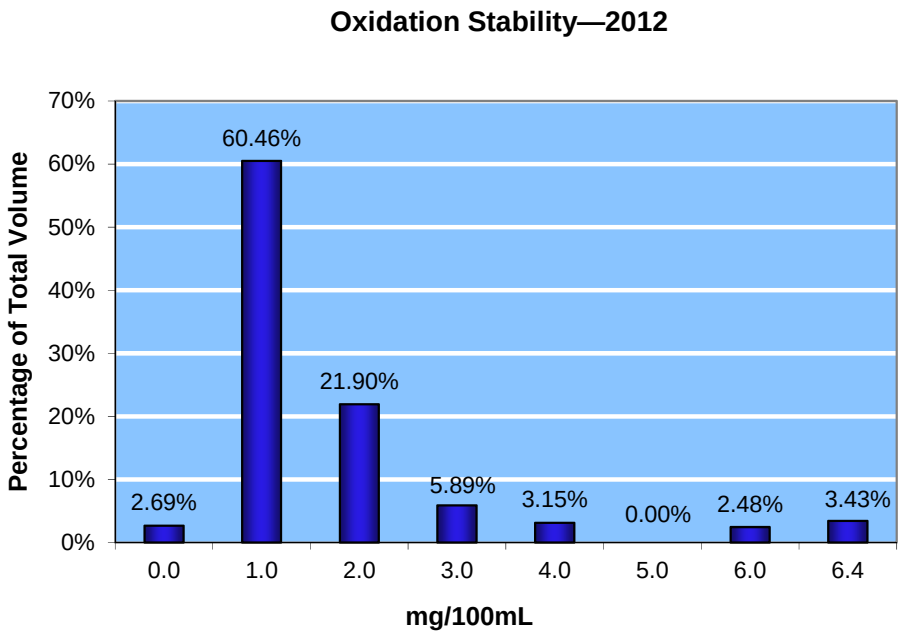


Figure 8-14: Oxidation Stability (mg/100 mL), maximum 25

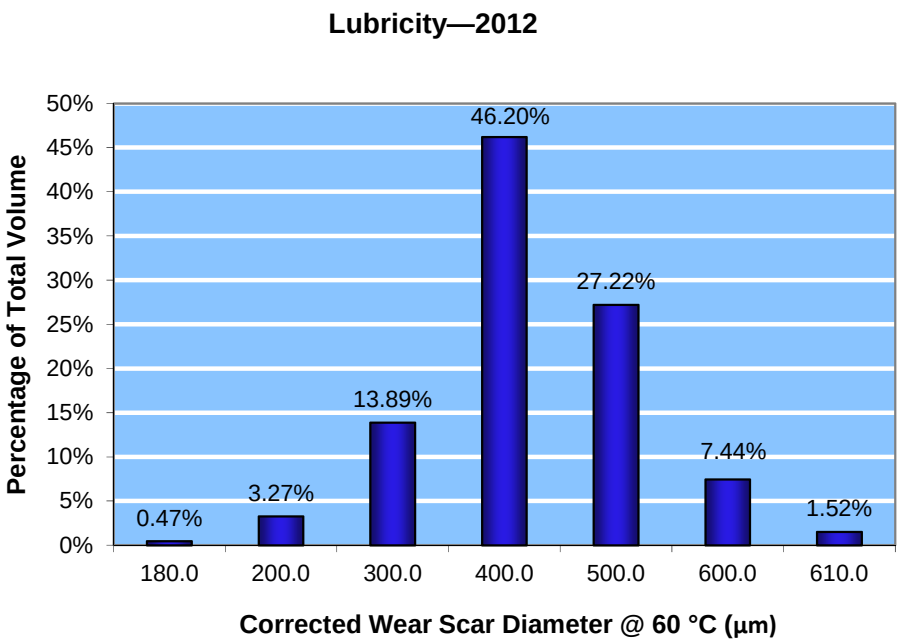


Figure 8-15: Lubricity, corrected wear scar diameter @ 60 °C (µm), maximum 520

Note: The lubricity requirement is applicable to fuels with sulfur content below 0.050 mass %.

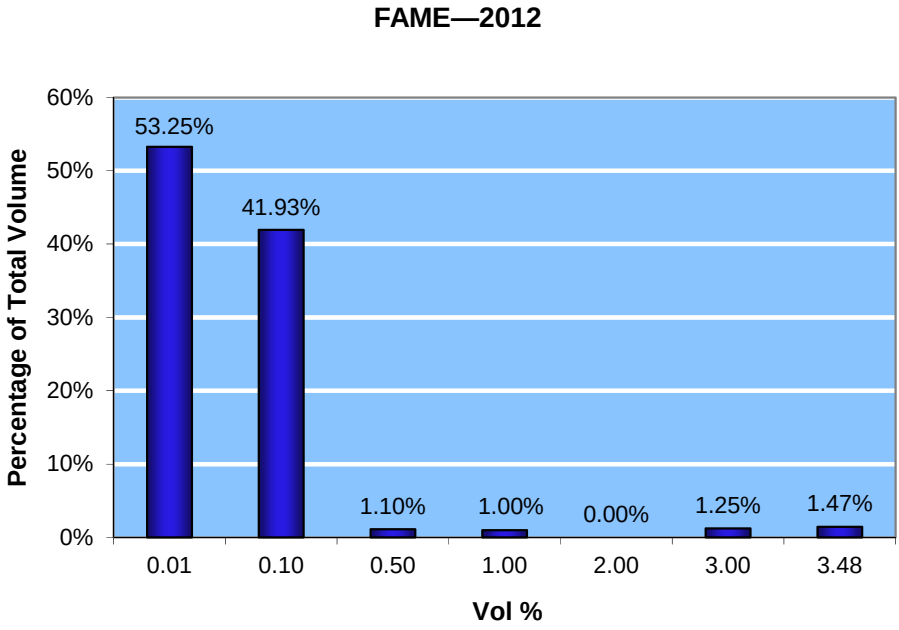


Figure 8-16: FAME (vol %), maximum 0.5

Note: The ISO-8217 Grade DMA requirements specify a 0.1 vol % maximum limit for FAME. The DLA Energy MGO clause has raised the maximum allowable contamination to 0.5 vol % as a result of a Navy test program.

Overview:

A total of 111 samples were processed through the Coast Guard In-Line Sampling Program during CY 2012. The majority of these samples included test measurement values for a wide range of fuel characteristics.

All 111 samples included tests performed for the following fuel properties: Appearance, Ash, Cloud Point, Copper Corrosion (@ 100 °C), Density (@ 15 °C), Distillation 90% Point, Distillation End Point, Distillation Residue + Loss, Flash Point, Cetane Index, Sulfur, Kinematic Viscosity (@ 40 °C), Acid Number, Demulsification (@ 25 °C), Particulate Contamination, Pour Point, Storage (Oxidation) Stability, Lead, Sodium + Potassium, Vanadium, Carbon Residue (test method D-4530), Lubricity, and FAME.

Calcium and Color values were not included for all 111 In-Line Sampling Program samples in CY 2012. Only 110 samples included test measurements for Calcium, while 53 samples included measurements for Color.

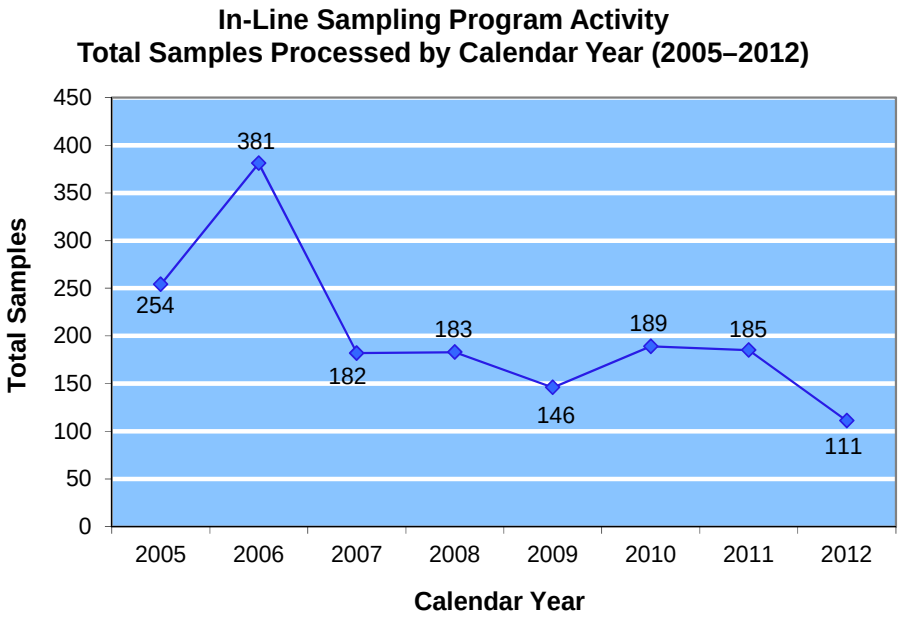


Figure 8-17: In-Line Sampling Program Activity, Total Samples Processed, CY 2005–CY 2012

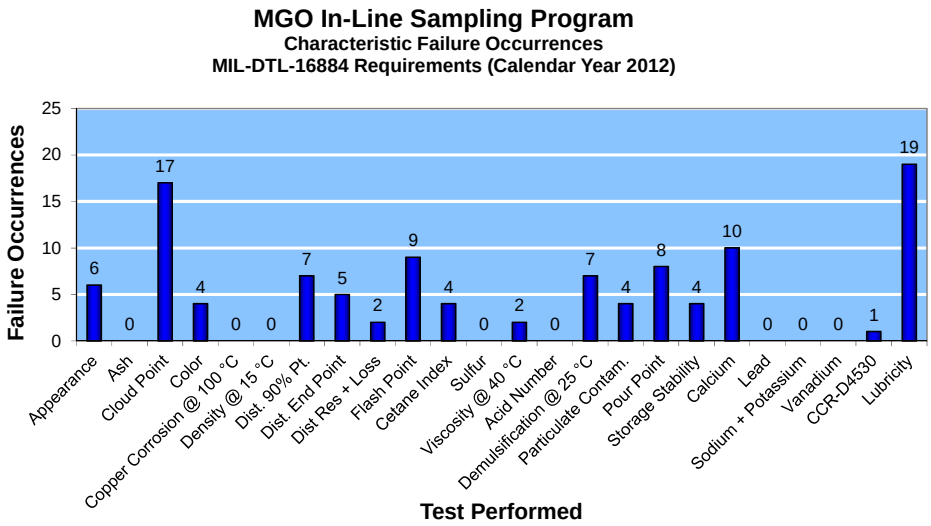


Figure 8-18: MGO In-Line Sampling Program, Characteristic Failure Occurrences, MIL-DTL-16884 Requirements, CY 2012

Note: The number of Sulfur failure occurrences in the figure is measured against the previous MIL-DTL-16884 limit of 0.5 mass %. The Sulfur maximum limit was changed to 0.1 mass % in August 2012. Thirty-five MGO Sulfur measurements exceeded this limit in 2012.

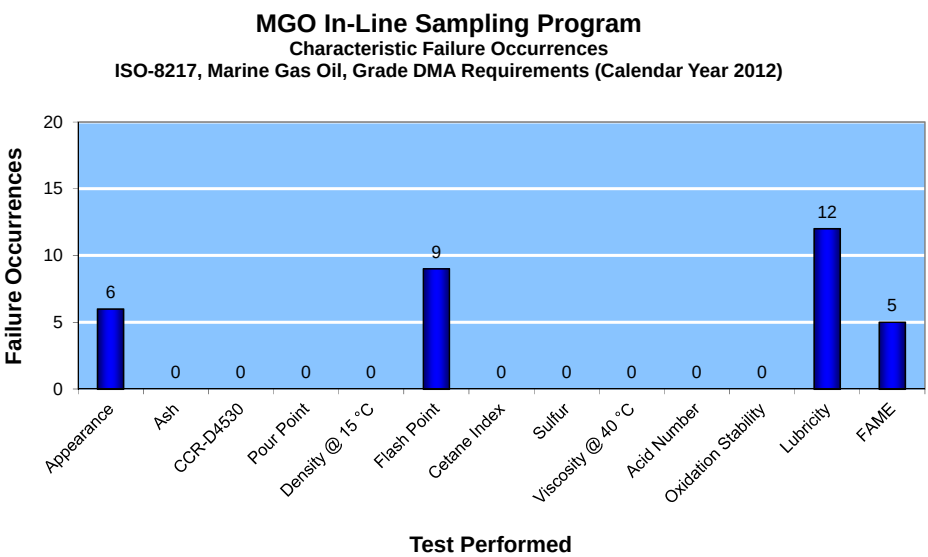


Figure 8-19: MGO In-Line Sampling Program, Characteristic Failure Occurrences, ISO-8217, Marine Gas Oil, Grade DMA Requirements, CY 2012

Note: The ISO-8217 Grade DMA requirements specify a 1.5 mass % maximum limit for sulfur and a 0.1 vol % maximum limit for FAME. Per Commercial Marine Gas Oil Minimum Specification Requirements (DLA Energy, October 2010), the maximum limit for sulfur is 1.0 mass %. For FAME, the DLA Energy MGO clause has raised the maximum allowable contamination to 0.5 vol % as a result of a Navy test program.

Turbine Fuel, Aviation, TS1 Russian Grade, GOST 10227-86			
Property	**2012 Source Inputs**		
	Region	**Volume**	**Batch**
Density:			
kg/m^3 @ 20 °C	8	NR	83
kg/m^3 @ 15 °C	8	NR	NR
Fractional Composition: (Distillation)			
Temperature at Start (IBP), (°C)	8	NR	83
10% Recovered, (°C)	8	NR	83
50% Recovered, (°C)	8	NR	83
90% Recovered, (°C)	8	NR	83
98% Recovered, (°C)	8	NR	80
Viscosity:			
mm^2/s (cSt) @ 20 °C	8	NR	82
mm^2/s (cSt) @ –40 °C	8	NR	14
mm^2/s (cSt) @ –20 °C	8	NR	54
Estimate of Heat Value: (kJ/kg)	8	NR	67
Height of Non-smoking Flame: (mm)	8	NR	68
Acidity: (mg KOH/100cm^3)	8	NR	83
Flash Point: (°C)	8	NR	83
Temperature of Crystallization: (°C)	8	NR	81
Aromatics: (vol%)	8	NR	66
Concentration of Resins: (mg/100cm^3)	8	NR	6
Sulfur, Mercaptan: (mass %)	8	NR	35
Sulfur, Total: (mass %)	8	NR	68
Ash Quantity: (mass %)	8	NR	NR

Table 9-1: Data Summary, Turbine Fuel, Aviation, TS1 Russian Grade, GOST 10227-86, 2012 Source Inputs

Turbine Fuel, Aviation, TS1 Russian Grade, GOST 10227-86					
Property	**Specification Limits (TC-1)**		**2012 Test Results**		
	Min	**Max**	**Min**	**Max**	**Mean**
Density:					
kg/m^3 @ 20 °C	**775**		785.0	798.0	791.5
kg/m^3 @ 15 °C	**Report**		NR	NR	NR
Fractional Composition: (Distillation)					
Temperature at Start (IBP), (°C)		**150**	132.5	154.0	141.6
10% Recovered, (°C)		**165**	154.0	171.0	163.5
50% Recovered, (°C)		**195**	175.0	199.0	190.2
90% Recovered, (°C)		**230**	202.0	239.0	221.3
98% Recovered, (°C)		**250**	213.0	265.0	242.6
Viscosity:					
mm^2/s (cSt) @ 20 °C	**1.25**		1.330	1.637	1.513
mm^2/s (cSt) @ –40 °C	**Report**		4.859	6.645	5.965
mm^2/s (cSt) @ –20 °C		**8.0**	2.830	3.779	3.473
Estimate of Heat Value: (kJ/kg)	**42,900**		43,175	43,493	43,266
Height of Non-smoking Flame: (mm)	**25.0**		25.0	28.0	25.3
Acidity: (mg KOH/100cm^3)		**0.7**	0.020	0.610	0.203
Flash Point: (°C)	**28.0**		29.0	45.0	38.6
Temperature of Crystallization: (°C)		**–50**	–64.0	–50.0	–56.5
Aromatics: (vol%)		**22.0**	11.00	18.30	15.89
Concentration of Resins: (mg/100cm^3)		**5**	1.00	4.00	3.17
Sulfur, Mercaptan: (mass %)		**0.003**	0.0001	0.0018	0.0008
Sulfur, Total: (mass %)		**0.25**	0.0003	0.0380	0.012
Ash Quantity: (mass %)		**0.003**	NR	NR	NR

Table 9-2: Data Summary, Turbine Fuel, Aviation, TS1 Russian Grade, GOST 10227-86, 2012 Test Results

9. TS1—Assessment Summary

Overview:

Turbine Fuel, Aviation, TS1, Russian Grade was a newly featured product reported for the 2006 procurement year. Due to a lack of reporting, TS1 was not included in the 2008 and 2009 PQIS annual reports, but it was once again incorporated in the 2010 and 2011 reports. For the 2012 procurement year, 84 batches were reported by Region 8 and recorded in the PQIS. The USSR State Standard Jet Fuels specification, GOST 10277-86, Grade TC-1, First Category of Quality, governs the procurement parameters for TS1 and they are presented accordingly.

The results presented in this chapter in the form of histograms correlate to the minimum and maximum table of specifications consistent with the previously described standard.

TS1 is being supplied in Afghanistan for the operational sustainment of forces committed in the region. TS1 is procured "neat" (containing no additives). Russian additives are not approved for use in U.S. aircraft and equipment. Approved additives may be added downstream as required or appropriate for end use.

Product quantities for TS1 were not recorded in the 2012 procurement year. For this reason, weighted mean results for this product cannot be shown.

TS1 Observations:

All batches met specification requirements for 2012.

Although some distillation temperatures fell outside of the specification limits, waivers have been issued throughout the year to accept Jet A-1 specification fuel in lieu of TS1 at certain locations. In addition, DLA Energy has accepted RT (PT in Russian) grade fuel for some locations. Distillation point values above the maximum specification limits are all covered under waivers.

Note: When reading the histograms for TS1, the far left bar represents the percentage of analyses associated with the minimum data value. Any other bar represents the percentage of analyses greater than the data value of the bar to the immediate left of it, up to and including the value of that bar.

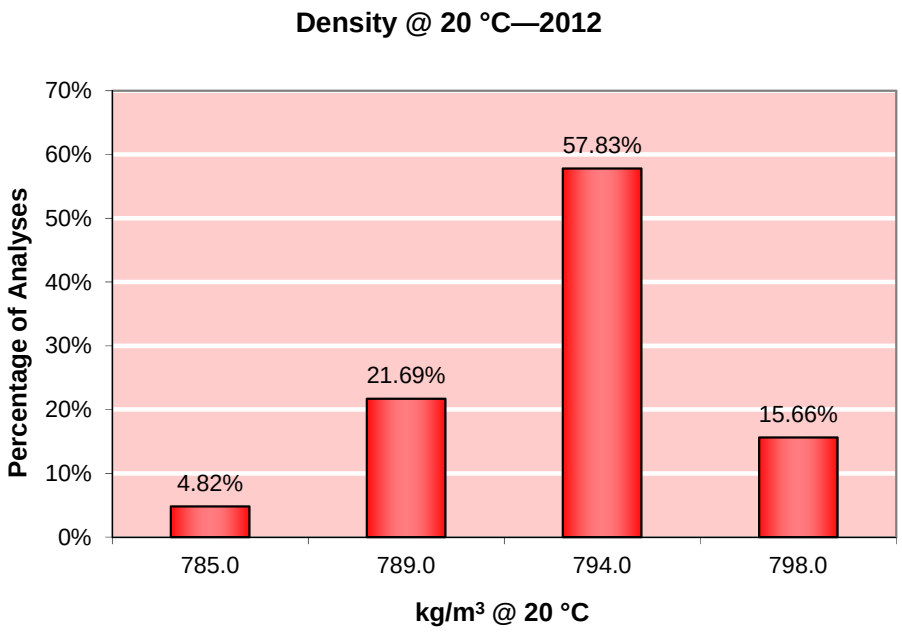


Figure 9-1: Density (kg/m^3 @ 20 °C), minimum 775

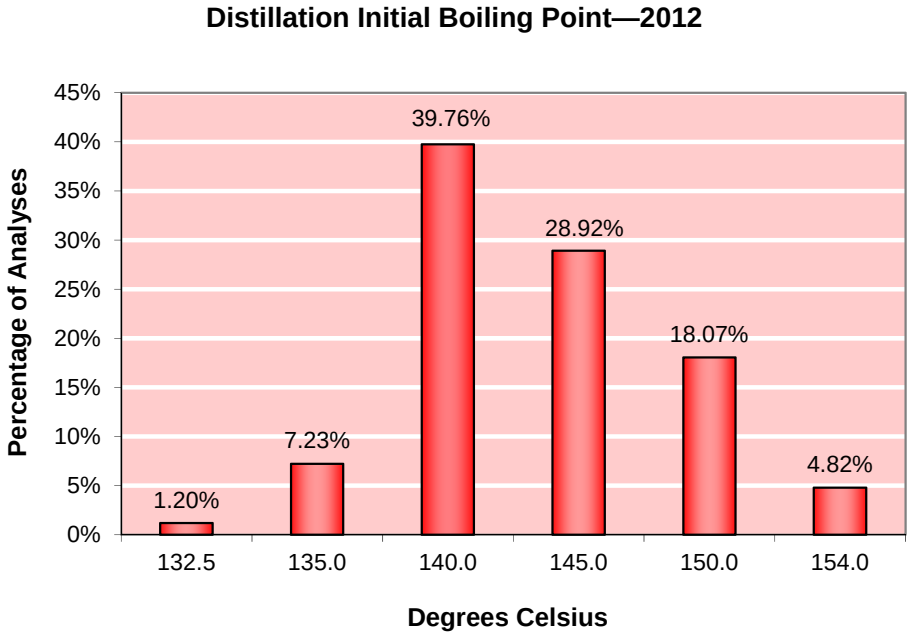


Figure 9-2: Fractional Composition (Distillation), Temperature at Start (Initial Boiling Point) (°C), maximum 150

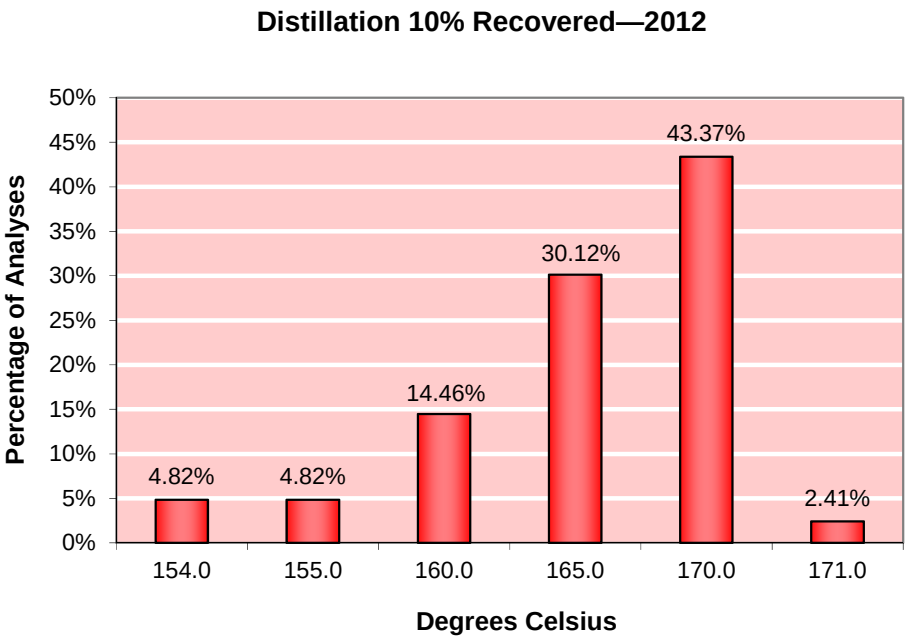


Figure 9-3: Fractional Composition (Distillation), 10% Recovered (°C), maximum 165

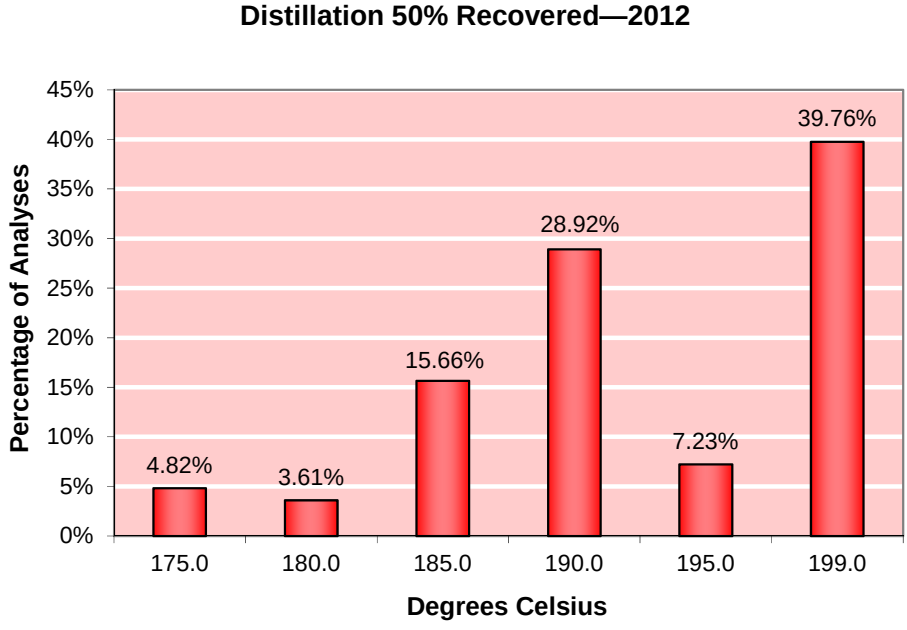


Figure 9-4: Fractional Composition (Distillation), 50% Recovered (°C), maximum 195

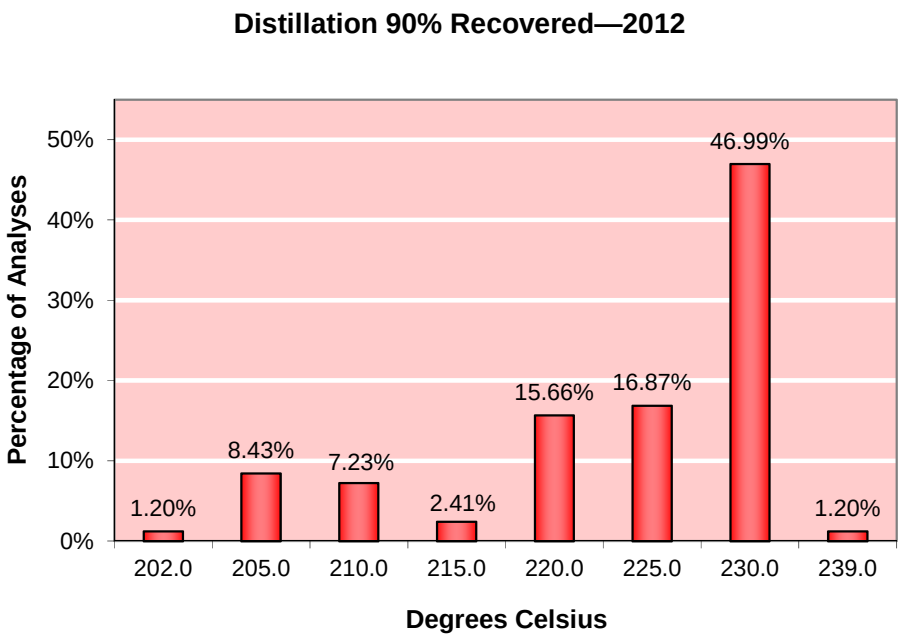


Figure 9-5: Fractional Composition (Distillation), 90% Recovered (°C), maximum 230

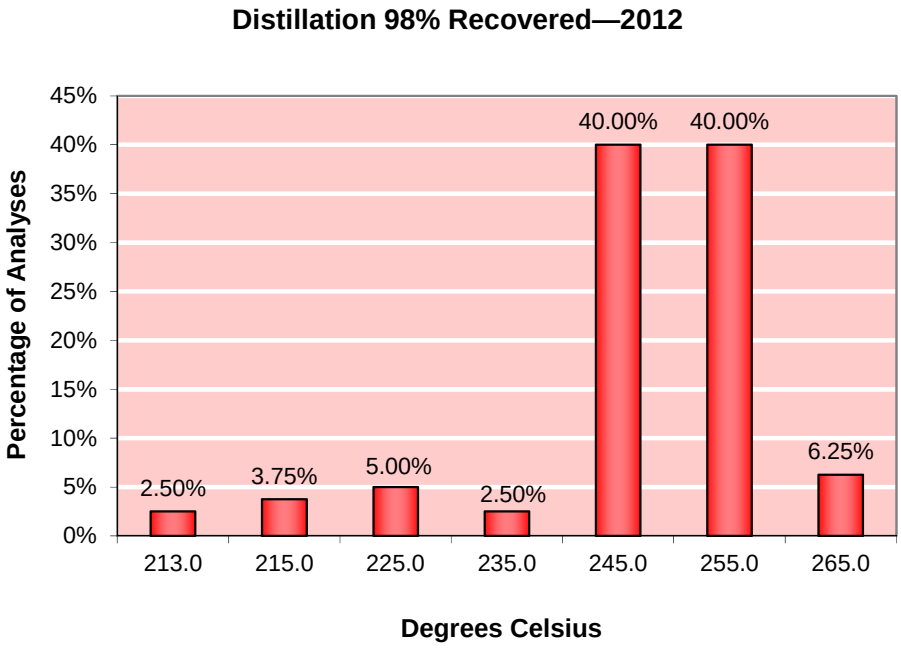


Figure 9-6: Fractional Composition (Distillation), 98% Recovered (°C), maximum 250

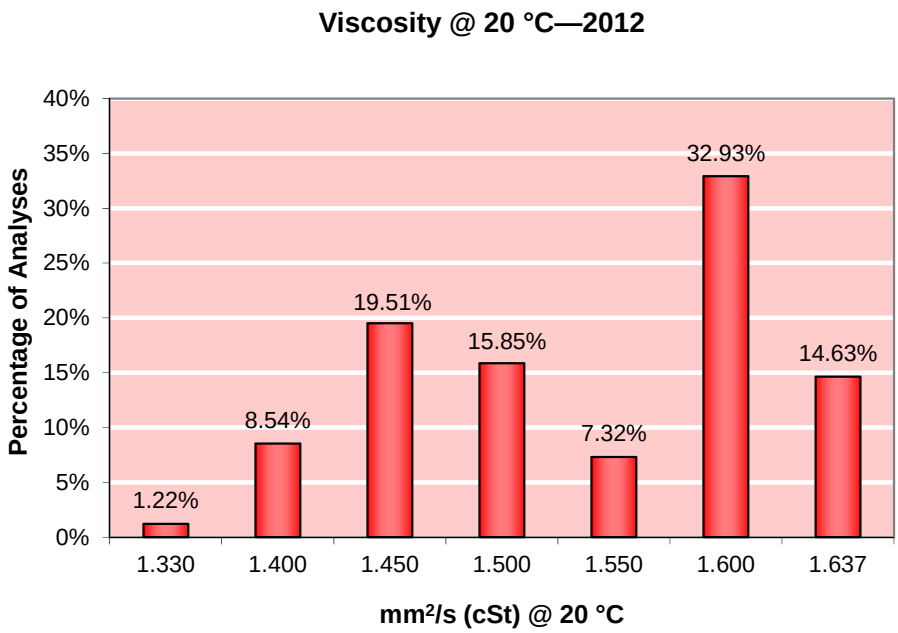


Figure 9-7: Viscosity (mm^2/s [cSt] @ 20 °C), minimum 1.25

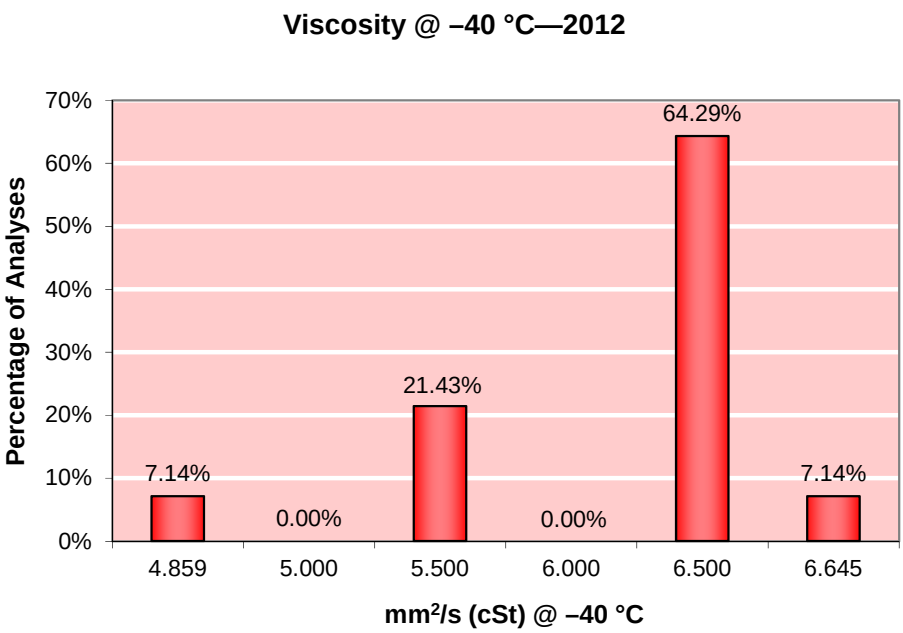


Figure 9-8: Viscosity (mm^2/s [cSt] @ –40 °C), Report

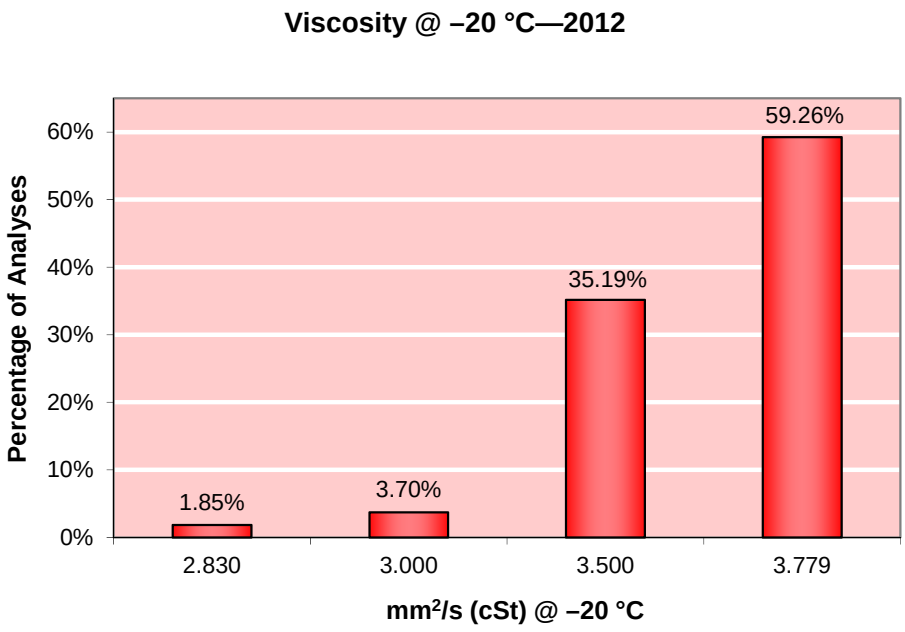


Figure 9-9: Viscosity (mm^2/s [cSt] @ –20 °C), maximum 8.0

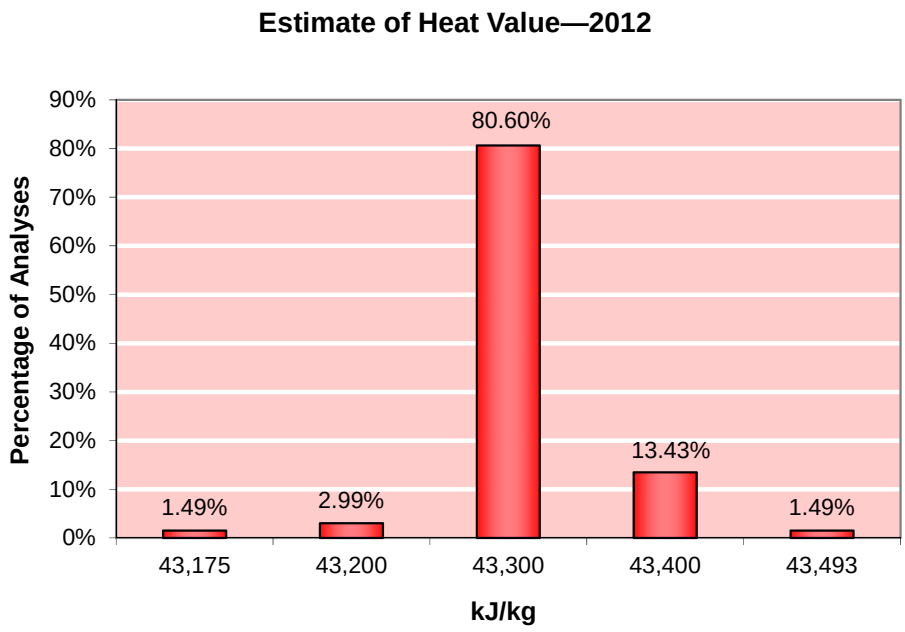


Figure 9-10: Estimate of Heat Value (kJ/kg), minimum 42,900

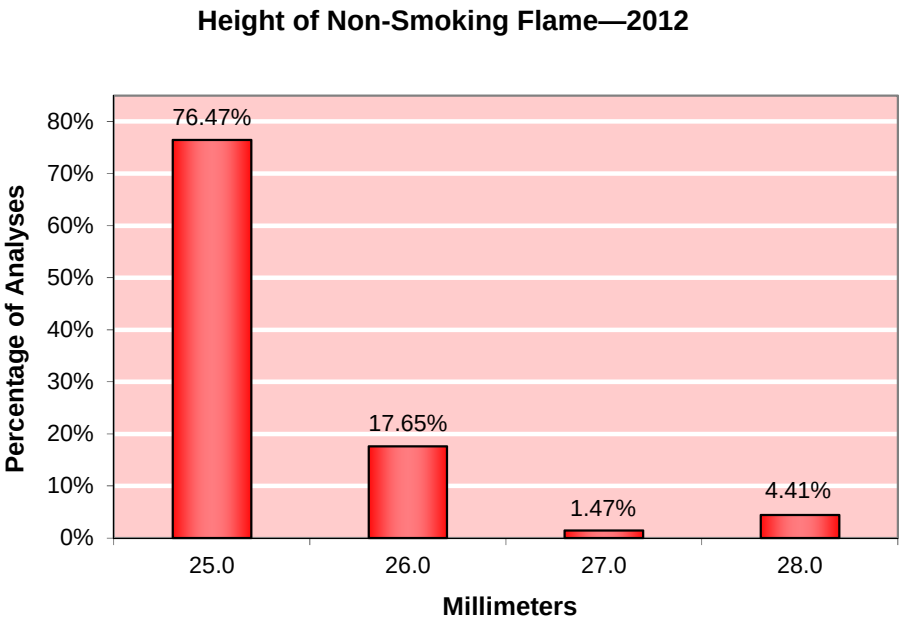


Figure 9-11: Height of Non-Smoking Flame (mm), minimum 25.0

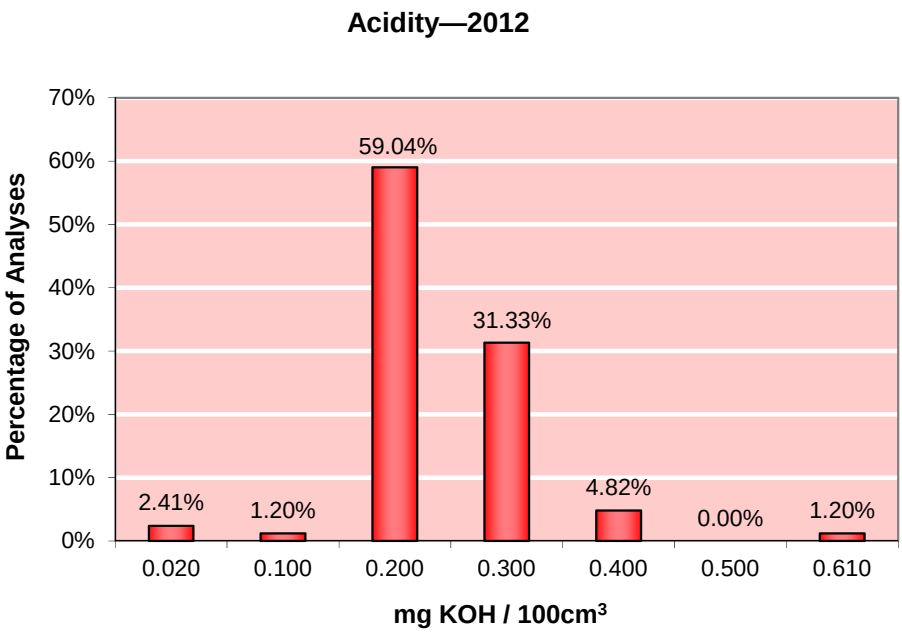


Figure 9-12: Acidity (mg KOH/100cm^3), maximum 0.7

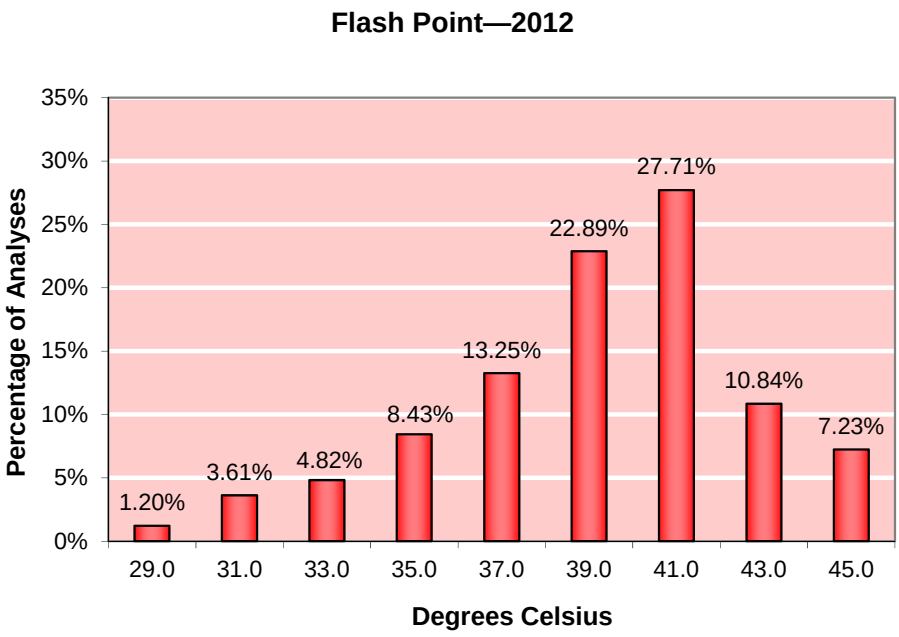


Figure 9-13: Flash Point (°C), minimum 28.0

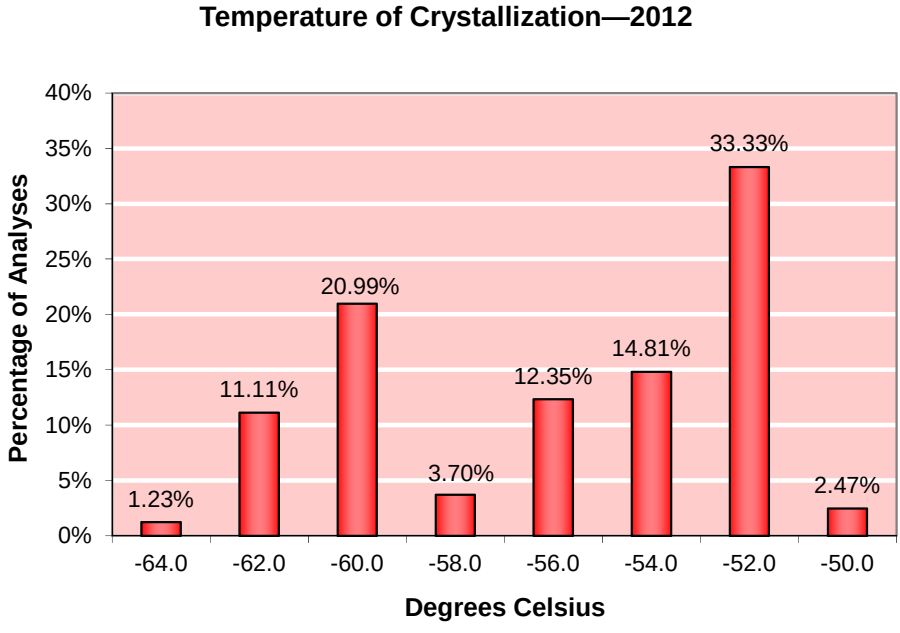


Figure 9-14: Temperature of Crystallization (°C), maximum –50

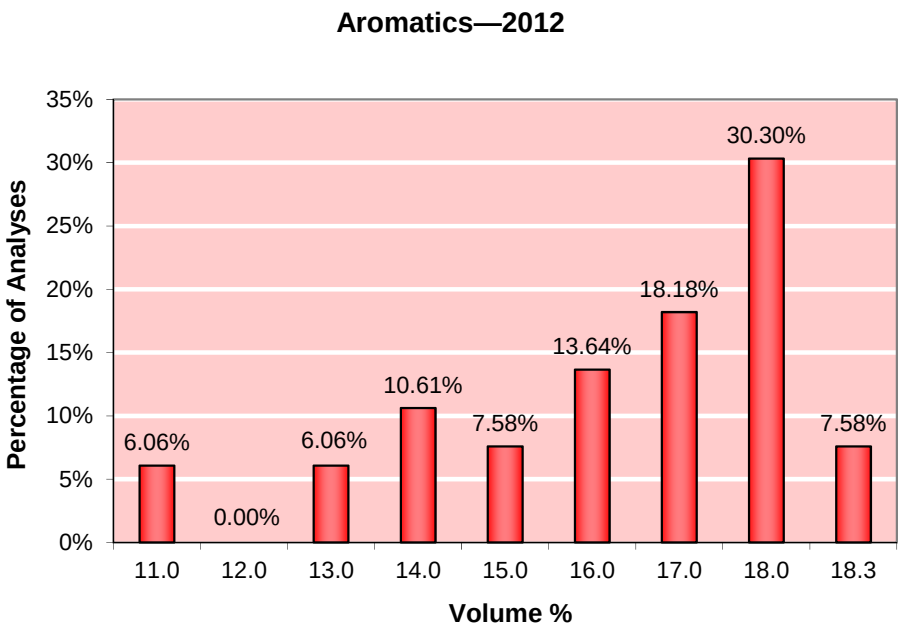


Figure 9-15: Aromatics (vol %), maximum 22.0

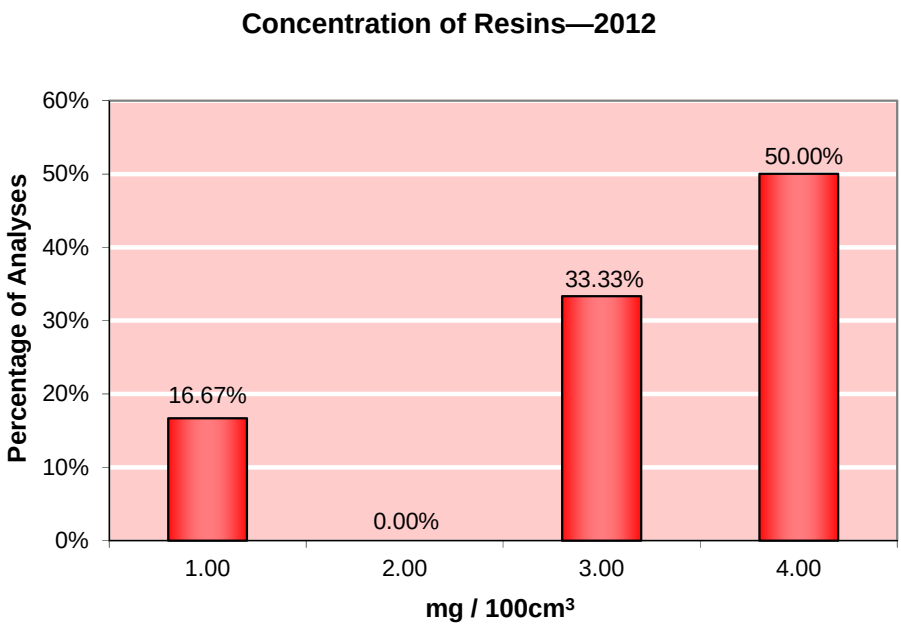


Figure 9-16: Concentration of Resins (mg/100cm^3), maximum 5

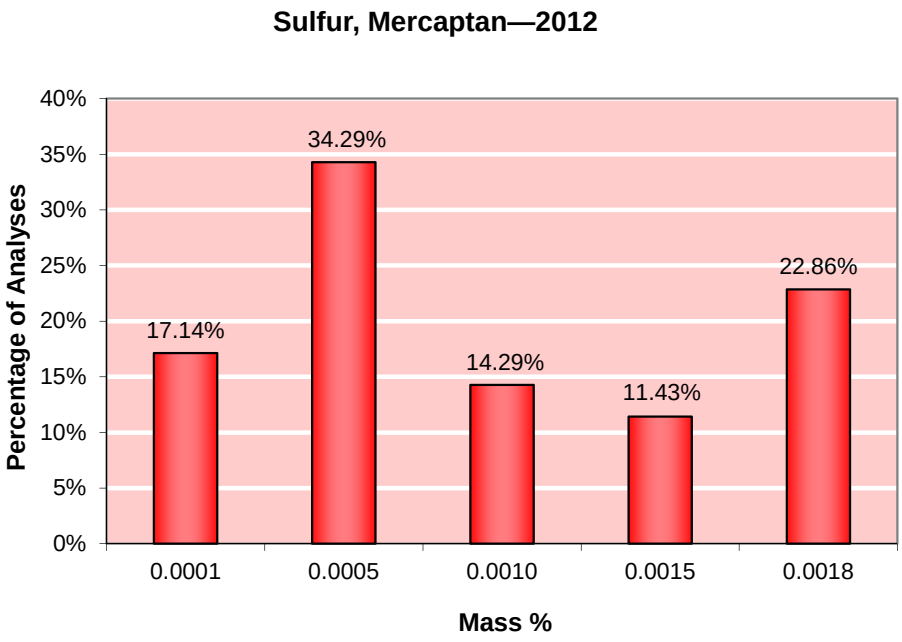


Figure 9-17: Sulfur, Mercaptan (mass %), maximum 0.003

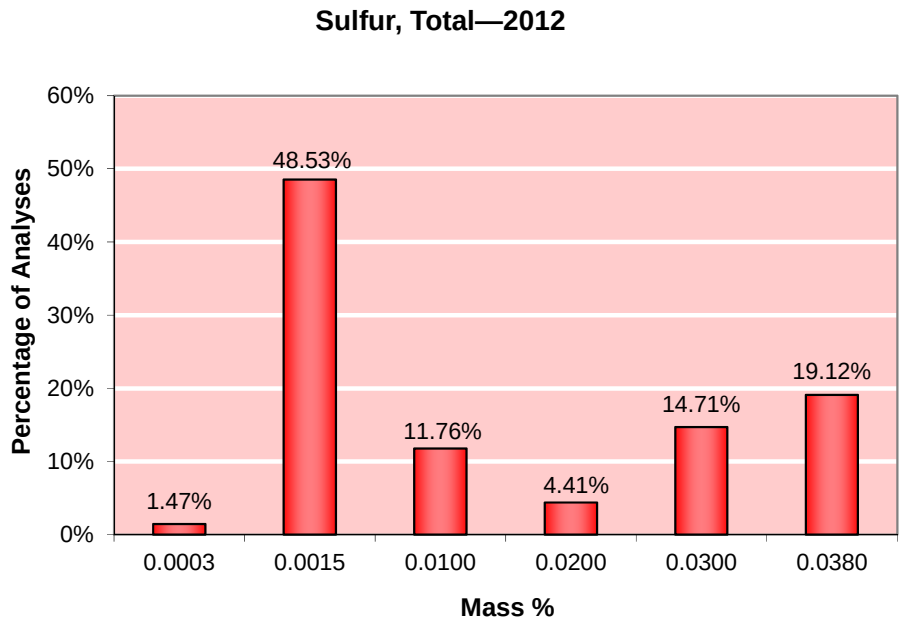
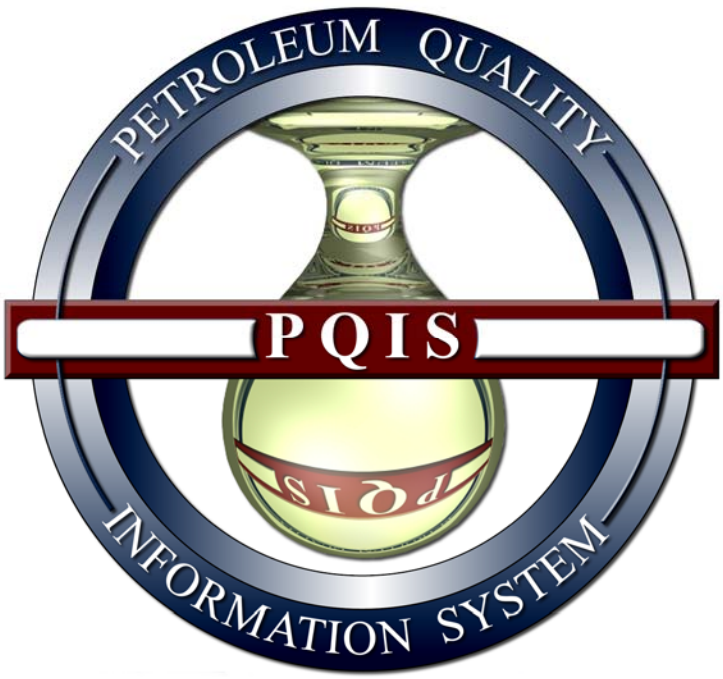


Figure 9-18: Sulfur, Total (mass %), maximum 0.25

9. TS1 Data



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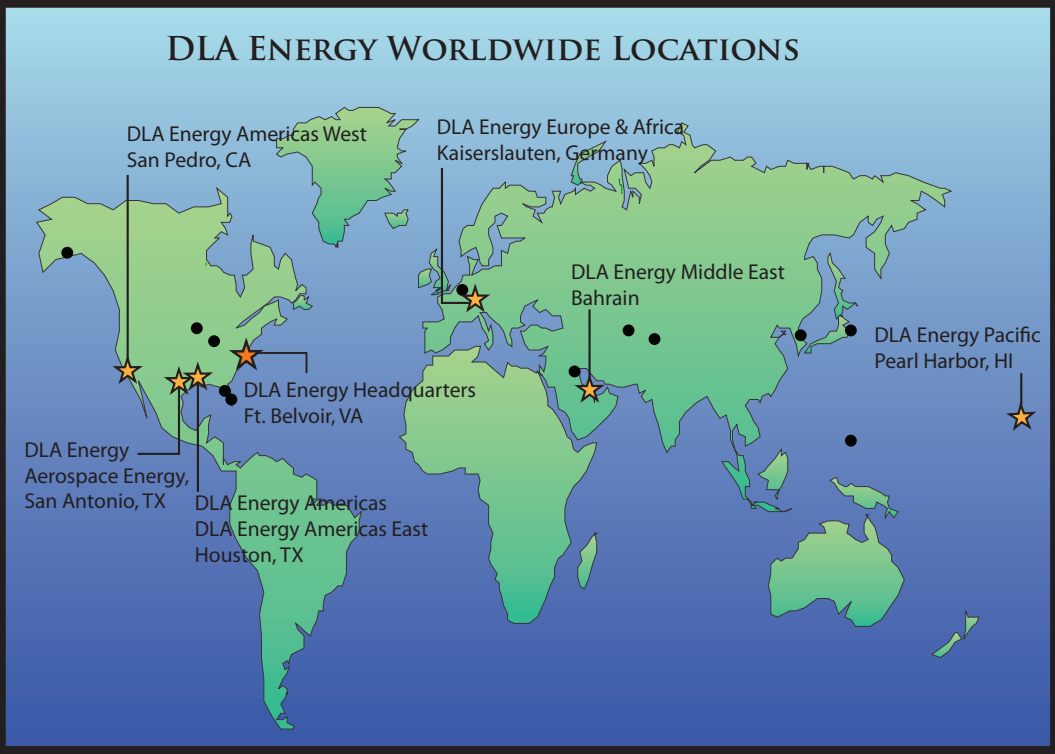

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